

Enhancing Information Support to Health and Biomedical Researchers

A Project to Support Oxford BRC-Funded Researchers Project Lead/Investigator: Eli Harriss

“As the biomedical literature continues to grow, Informationists play a valued role in their ability to analyze results of a literature search, critically appraise and select the most relevant information, and facilitate access and delivery of information in the most efficient ways.

Researchers can rely on Informationists to identify previous studies, gaps in published literature, and funding opportunities for grants. Organizing and managing information, preparing and developing materials for courses and conferences, improving publication output and measuring the impact of research also rank highly with regard to valuable services provided by information experts...

In the realm of education, informationists partner with faculty to teach evidence-based searching skills and critical appraisal techniques. They plan, implement and develop materials and assessment metrics for curriculum courses that are designed to increase information literacy, which also saves time for those faculty who wear multiple academic hats.”

Informant NA-13

Acknowledgements

The Project Lead would like to express her gratitude to all study participants for their time and valuable contributions, and to Bodleian Health Care Libraries (BHCL) colleagues and external advisors for their support and advice. This work was supported by the NIHR Biomedical Research Centre, Oxford. BHCL staff have been supported by external consultants in information studies research.

Secondary Authors/Investigators: Donald Mackay, Owen Coxall
External Advisors: Christine Urquhart, Alison Yeoman

Contents

Acknowledgements.....	1
Contents.....	2
1 Introduction	4
2 Summary Findings.....	5
3 Summary Recommendations/Actions	6
4 Findings and Recommendations.....	8
4.1 Information needs and opportunities for service development	8
Proposed Actions	10
4.2 The applicability of the “Research Informationist” role to the Oxford BRC	13
Proposed Actions	15
4.3 Core and additional staff skills and training.....	16
Proposed Actions:	17
4.4 Presentation and awareness of services.....	18
Proposed Actions:	18
5 References	21
Study Report.....	23
6 Introduction	23
6.1 Aims.....	23
6.2 Context.....	23
7 Methodology.....	25
7.1 Literature Search.....	25
7.1.1 Search strategy.....	25
7.1.2 Study selection	25
7.2 Interviews with LIS staff	25
7.3 US informationists: emails and online focus group questions	26
7.4 Interviews and focus groups with researchers funded by the Oxford BRC	26
7.5 Website searches: informationist job descriptions	27
7.6 Website searches: Library biomedical research support.....	27
7.7 Ethics	27
7.8 Limitations.....	27
8 Findings	29
8.1 Library services provided to biomedical researchers	29
8.1.1 The Literature.....	30
8.1.2 The Webpage Review.....	31
8.1.3 Other BRC Sites	33
8.2 What do BRC staff perceive as information and service needs?	35

Perceived information needs of biomedical researchers	36
8.2.1 Finding support and training.....	38
8.2.2 Barriers to accessing information or support	41
8.3 Embedded Informationist Services.....	44
8.3.1 The development and benefits of embedded information specialist and informationist services: the literature	44
8.3.2 The interviews, emails and focus groups with LIS staff and US informationists	47
8.3.3 How do BRC staff perceive services that could potentially be provided by an informationist?	53
Would staff welcome an informationist joining their teams?	61
8.4 Informationist Skills and Knowledge.....	64
8.4.1 Core Informationist Skills and Knowledge	64
8.4.2 Attributes of informationists	66
8.4.3 Informationist education and training.....	66
8.4.4 Future trends	67
8.5 Promotion and Awareness.....	68
8.5.1 Challenges and barriers to promotion and awareness of information and support services	69
8.5.2 Suggestions for improving promotion	70
Appendix 1: Databases searched for literature review and Ovid Medline search strategy	73
Appendix 2: Interview schedule for LIS staff	75
Appendix 3 Information sheet/web page.....	76
Appendix 4 Questions for North American informationists	78
Appendix 5 Interview schedule for BRC researchers/staff	79
Appendix 6 Consent form	81
Appendix 7: Services Reviewed	82
References	83

1 Introduction

Oxford is a world-leading centre for health care and biomedical research in all its forms. The Bodleian Health Care Libraries (BHCL) services work with NHS and University of Oxford Medical Sciences Division researchers at all levels, providing many of the services recognized as being key to supporting biomedical researchers. We were keen to explore further how our library services can be more embedded within, and better support the workflows of, Oxford's biomedical and translational research community and the central services of the Biomedical Research Centre (BRC).

In response to the increasingly complex information needs of health care researchers, a rich and diverse spectrum of services is being offered by libraries in biomedical and translational research institutions across the world. In the USA, the National Institutes of Health and various other institutes have long established "informationist" (or Information Specialist in Context) programmes and posts providing research and knowledge management services for biomedical research at each step of the research process, from grant-seeking to final publication. However, the development of this kind of informationist role has been more limited to date in the UK and elsewhere in Europe.

In this study, using a multi-method approach (including a critical synthesis of the literature, a review of services elsewhere, and interviews and focus groups with BRC funded researchers and administrative staff) in Oxford, we aimed to identify:

1. The core services that should be part of the "standard" offering to Oxford BRC-funded and other researchers.
2. a) Gaps in the current library service provision and, b) key areas of knowledge management/information support where a more embedded information specialist could provide support to biomedical researchers and the BRC.
3. The specific applicability of the "Research Informationist" role to the Oxford context and the BRC.
4. The core additional skills and knowledge required of library staff to provide more embedded support to the BRC and within the wider Oxford/UK biomedical research context.
5. How the library service can better present and make the Oxford biomedical/health care research community more aware of the services available.

Our study focused on Oxford BRC-funded scientists but, as well as being applicable to other biomedical researchers in Oxford, the outputs will also be of interest to the wider UK library community supporting biomedical and translational research centres.

Sections 1 to 5 of this report present a high-level summary of the work as well as its main outcomes and associated recommendations. The full report of the project on which these are based is provided in the subsequent sections (with a separate and fuller bibliography).

2 Summary Findings

Our findings demonstrate that there are key areas of knowledge management and information support where a more embedded information specialist could provide targeted support to BRC funded researchers in Oxford and that there are several BRC Themes where this type of support would be very welcome.

Even in those Themes for which an embedded post was not the preferred approach, most BRC interviewees saw a role for an information or library professional assisting their team with at least some of the twelve specific information support activities discussed.

Our study confirms that researchers funded by the Oxford BRC have a range of work needs covering all stages of the research project lifecycle, such as searching for the initial literature to start a project, coordination and management, and producing outputs (publications and others “around translational medicine” (BRC-RS2)).

The top four information needs for all three BRC staff groups interviewed are: personal information and reference management; publishing support; literature searching (as an individual responsibility as well as for systematic reviews); and research data management (RDM). This finding is reflective of the literature.

The study has highlighted the key information needs of BRC-funded researchers and associated staff and has flagged several barriers which prevent or hinder their access to information or support. The latter includes a lack of awareness of the services available to them, issues around the time and effort required to find information or learn about library services/resources, and problems with access to online journals.

We have also identified a number of areas where, and the ways in which, the research community’s awareness of services available to them can be enhanced and have identified priority areas of skills development for library staff.

The most frequently highlighted areas where an informationist’s support was flagged as valuable were literature searching, RDM, and reviewing, editing, and co-authoring articles for publication. Other areas of support with significant multiple mentions included bibliometrics, bioinformatics, copyright, grant writing, support for open access, reference management, and support for interdisciplinary research.

This all flags areas where additional support from the library could be provided and indeed do reflect services provided to biomedical/healthcare researchers by some other institutional libraries. Two of these areas – data management and publishing support – are areas where support is less developed at Oxford than elsewhere, and could benefit from increased promotion of current services (see below).

These, and other areas of support needs articulated, are also areas for which the services that an informationist or embedded information professional could be deployed to meet in those Themes that appeared most receptive to this style of support. As outlined in the relevant sections elsewhere in this summary, most BRC interviewees saw some role for an information or library professional in assisting their team with at least some of the twelve specific information support activities discussed, including the top four information needs flagged above and in several other areas.

More widely, from our analysis of the data we see that there is a broad uniformity of “standard” library services offered to health care researchers in our peer institutions. Library and information support provided to health care researchers by BHCL and the wider Bodleian are generally in line with these.

Looking at more advanced areas of support, Bodleian services offered to the BRC and wider Oxford University health care research community for open access publishing, systematic reviews, reference management and literature searching appear to be amongst the more advanced examples encountered in our review.

The study has also identified several areas of service delivery with potential for further development and/or for further review based on services provided elsewhere and by the information support needs articulated by BRC funded researchers and staff. These include research data management, copyright, bioinformatics, and support for publishing.

In addition, even in those areas where our services are currently delivered in some depth there are lessons to be drawn from work undertaken elsewhere (for example, managing demand for systematic review support and perhaps more advanced support for impact/bibliometrics).

3 Summary Recommendations/Actions

Headline Recommendations

- An eighteen-month pilot project to embed a member of staff with one or more of the Themes which were most receptive to the informationist idea. This follows a precedent study from Cambridge in a Department of Engineering team (1) and would provide valuable additional data to evaluate the impact of the informationist role in a health care/biomedical research context.
- The recruitment of a full-time or part-time Outreach Librarian (possibly combined with the above post), not embedded in a specific team or teams, but supporting a ranges of teams across the BRC to provide more specific capacity and bespoke services to BRC staff and researchers to address some of the key barriers and information needs identified in this project.
- Development of a programme of information skills training tailored specifically for BRC staff and funded researchers and embedded within or with strong links to the main Oxford BRC training programme.
- A review of access to online journals and databases by BRC funded researchers and BRC employed staff.

Service/Staff Development Actions:

- Review and revise BHCL support and presentation of support for “Scholarly Communication” (writing and publishing articles, impact analysis, copyright, and related activities).
- Review of BHCL support for research data management and systematic reviews.
- Survey of current bioinformatics support available to Oxford health care researchers and potential opportunities for library support/collaboration in this area.
- Update of the BHCL library staff skills audit toolkit and implementation plan to include further development of skills in RDM, publication support (including grant writing), research impact (beyond bibliometrics and altmetrics), and copyright. Also to focus on ongoing development of interpersonal soft skills and (where required) subject domain knowledge.

- Review staff structure across BHCL to identify potential opportunities for “thematic experts” – e.g. RDM, bibliometrics, open access; and/or a Bodleian Outreach Librarian with a specific Scholarly Communication role as part of their remit.

Marketing Actions:

- Further develop BHCL’s and the wider Bodleian’s social media and Web presence in support of BRC-funded and other MSD researchers.
- Further develop traditional (print) and online marketing materials aimed at BRC and other MSD health care researchers with focussed messages on how the library can help specific aspects of their work (e.g. open access, impact, public engagement).
- Undertake a focussed programme of outreach by Subject and Outreach Librarians to establish or re-establish personal contacts with key MSD departmental and BRC Theme contacts and potential champions.

4 Findings and Recommendations

4.1 Information needs and opportunities for service development

(Core services, gaps and opportunities)

Our interviews demonstrated that, in line with much of the evidence from the literature, researchers funded by the Oxford BRC have a range of work needs covering all stages of the research project lifecycle, such as searching for the initial literature to start a project, coordination and management, and producing outputs (publications and others “around translational medicine” (BRC-RS2)).

The four most frequently mentioned information needs for all three BRC staff groups interviewed are: personal information and reference management; publishing support (writing and publishing articles); literature searching (as an individual responsibility as well as for systematic reviews); and research data management. This finding is reflective of the literature.

They seek support and training from sources across the University and perceive the library as a place to go for training on information management skills. For example, for training on data management skills they look elsewhere, to ‘University’ or NHS courses, or are self-taught. For literature searching skills, they often approach the Bodleian (BHCL), colleagues or managers, or are self-taught.

Our interview data revealed several different barriers which prevent or hinder BRC staff’s access to information or support, some of which may reflect opportunities to develop or expand current service provision. The most frequently mentioned were: access to papers or books; a lack of awareness about library services and services provided; and the time and effort required to find information or learn about library services or resources provided.

Researchers’ awareness of services provided by libraries in Oxford is discussed in detail further below. Regarding problems with access to papers or books – this barrier came as something of a surprise given the vast majority of BRC funded researchers have access as members of the University of Oxford to one of the largest collections of print and online journals and books in UK Higher Education. There is clearly some additional need for more in-depth analysis specifically of BRC-funded researchers and associated staff’s access to online content.

This all flags areas where additional support from the library could be provided, and reflect services provided to biomedical/healthcare researchers by some other institutional libraries. Two of these areas – data management and publishing support – are areas where support is less developed at Oxford than elsewhere and/or that could benefit from needs improved promotion of current services (see below).

These, and other areas of support needs articulated, are also areas for which the services that an informationist or embedded information professional could be deployed to meet in those Themes that appeared most receptive to this style of support (see below). As outlined in the relevant sections elsewhere in this summary, most BRC interviewees saw some role for an information or library professional in assisting their team with at least some of the twelve specific information support activities discussed, including the top four information needs flagged above and in several other areas. Looking more broadly at other institutions’ health care library services, library and information support available to health care researchers by the Bodleian are generally in line with those found at the vast majority of Oxford’s peer institutions.

From our analyses of the data (literature search, interviews, webpages review) we see that there is a broad uniformity of standard library services offered to biomedical researchers. These include: a range

of physical facilities; print and online content; document delivery services; “branded” programmes of training offered to researchers; variants of subject/faculty/departmental liaison librarians providing one-to-one consultations (as well as other services); support for reference management; and support for literature searches. These “core” or “standard” services for biomedical and other health care researchers are reflected in the literature.

All of these services are provided to health and biomedical researchers in Oxford – for example the iSkills branded training programme for research students reflects those provided by the majority of our international peers.

Bodleian support offered for open access publishing, literature searching, systematic reviews, and reference management is amongst the more advanced examples.

Moreover, no significant areas of additional possible support were identified from our review of library services associated with the other UK BRCs. It should be noted that some aspects, such as critical appraisal training and participation in a regular BRC training programme offered by one BTC supporting library service, are not delivered routinely to the BRC by the Bodleian. None of the respondents plan to develop any specific or specialist services in support of their BRCs.

It is clear from the literature and our review that there are some areas where support at some other institutions is provided to health care researchers in more depth, or is presented in a more user-friendly way, than at Oxford. These areas include: research data management and data training; copyright; support for publishing, bioinformatics support, and specialist embedded services. In addition, even in those areas where our services are currently delivered in some depth there may be lessons we can draw from work undertaken elsewhere (for example, managing demand for systematic review support and perhaps more advanced support for research impact/bibliometrics).

The RDM support provided by the Bodleian to healthcare researchers appears to be more embryonic in its delivery and presentation than at some other leading institutions.

The vast majority of library services reviewed offer help and advice at some level on bibliometrics, altmetrics and other aspects of measuring/tracking impact. Library services at Oxford reflect those offered by the majority of other services but several of our peer institutions provide more tailored and in-depth support than is available at Oxford. This includes actual or virtual units and specific posts based in their medical or main libraries whose support goes beyond “traditional” metrics.

In regard to copyright at Oxford, the Bodleian provides a set of webpages in support of copyright enquiries and a dedicated email copyright enquiry address but these are buried very deep within the Bodleian’s main webpages.

Over and above the areas of support outlined above, many of the libraries reviewed also flag support for other aspects of publishing and scholarly communication. These include: providing guidance on how to identify the best journals in which to publish; offering training and advice in writing for publication and publishing; offering assistance with manuscript preparation; advice on formatting affiliations or addressing recommendations; support for ORCID registration; and support for VIVO, Pure and similar local research networking and discovery tools.

Of these examples, the Bodleian currently only provides support for ORCID registrations, advice on affiliations (in the case of the BRC) and limited guidance on finding relevant journals in which to publish. “Writing for publication” and other related academic skills training are provided via graduate

skills development programmes and through other institutional training providers at Oxford, and this is worth exploring further.

Support for systematic reviews by BHCL is advanced and ranges from one-to-one help and advice on searches, to systematic review search workshops, to undertaking scoping and protocol searches, to undertaking full systematic review searches. However, no explicit service offer is provided on the levels of support that is offered by the library and (for example) no requirement is routinely made for an acknowledgement or author credit. These are some lessons to be learned

Support for bioinformatics is provided at only a minority of American library services, but it is at a significant minority and is not currently supported by the Bodleian or by any other non-American library service reviewed. It was also flagged as a possible area of useful support by several BRC interviewees. Note that in Oxford there are already other groups, in areas such as the Department of Statistics and the Wellcome Trust Centre for Human Genetics, which have particular strengths in bioinformatics and statistical genetics. It may therefore be the case that in this area the action for the library is to signpost other support services, but certainly a more in-depth review of local support in this area would be useful.

There are also some differences in the way services aimed at researchers are presented or branded online at many of our peer institutions compared to Oxford.

Almost all of the libraries that were reviewed present their services specifically to researchers in particular sections of their webpages, with many of them structuring these around the different stages of the research cycle. A significant number present their support for publishing, open access services, RDM, and bibliometrics online under the general heading of “Scholarly Communication”, or variations on that term. A minority have teams specifically to provide this support.

This is different to the way in which library services (including medical library services at BHCL) for researchers are currently presented online at Oxford. Nor is there any kind of “Scholarly Communication” team in a physical sense at Oxford (other than the federated team of subject and other staff supporting open access).

The webpages review, literature search and interviews therefore clearly indicated some areas where current library services in support of BRC and MSD researchers could be reviewed, where the presentation of existing service might benefit from some refocussing, and some areas of potential support where the Bodleian can further investigate local demand and potential service delivery.

A series of actions (short, medium and long term) are proposed to address the gaps and barriers highlighted.

Proposed Actions

Note that additional funding and some additional staff resource will be required to implement the majority of the actions proposed in this and the following sections (see sections below).

Links with BRC:

- Development of an Outreach Librarian post specific to the Oxford BRC. To provide in-depth and proactive and on-demand services including training, literature searching, current awareness, bibliometrics impact, and other support to BRC researchers and administrative staff. Possibly

combined with a more embedded approach in selected Themes. Also to help implement other proposed actions outlined below.

- Development of a programme of information skills training tailored specifically for BRC staff and funded researchers and embedded within or with strong links to the main Oxford BRC training programme.

Access to Online Content:

- Review of access to online journals and databases by BRC funded researchers and BRC employed staff.

Scholarly Communication:

- Initialise discussions with colleagues across the Bodleian on a more uniform online and offline approach to, and presentation of, support for “Scholarly Communication”.
- Survey BRC-funded and other MSD researchers on potential requirements for additional copyright/impact/other Scholarly Communication support.
- Review staff structure across BHCL to identify potential opportunities for “thematic experts” – e.g. RDM, bibliometrics, open access and/or a Bodleian Outreach Librarian with a specific Scholarly Communication role as part of their remit.

Publishing:

- Review availability across the University and beyond of support for writing articles and other support for publishing for BRC and other MSD researchers.
- Update/create Bodleian online guides (LibGuides) on publishing support (to include support available from elsewhere in the University).

Copyright:

- Discuss options for additional copyright support (if demand is evidenced) with central Bodleian colleagues.
- Create a LibGuide on Copyright for BRC funded and other MSD and update and position a more prominent link to the Bodleian copyright webpages.

Impact:

- Update Bodleian Impact LibGuide (including incorporating of impact support beyond altmetrics and traditional metrics).
- Develop a Bodleian iSkills Impact workshop with a more specific biomedical/health care focus.

Systematic Reviews:

- Review, agree and promulgate a tiered service offer for systematic review support including requirements for credits and co-authorships, a Memorandum of Understanding, and costings.
- Update BHCL’s Systematic Review LibGuide.

Research Data Management:

- Develop a Bodleian programme of RDM training sessions for BRC funded and other MSD junior researchers.

- Expand the Bodleian's RDM support webpages aimed at BRC funded and other MSD researchers.
- Develop a programme of RDM training for Bodleian Outreach Librarians.

Bioinformatics:

- Survey BRC funded and other MSD researchers for any requirements for bioinformatics support.
- Undertake further scoping work on the bioinformatics support already available to BRC funded and MSD researchers across Oxford.
- Explore options/and potential opportunities for library support/collaboration in this area.

Other Communications & Library Staff Development: See relevant sections following.

4.2 The applicability of the “Research Informationist” role to the Oxford BRC

...if you were to tell me you could do all of this now, I'd be like “that's amazing”. I'd get you on board now...

(BRC-SR3)

Our findings suggest that there are key areas of knowledge management and information support where a more embedded information specialist can provide targeted support to BRC funded researchers in Oxford and that there are some Themes where this type of support would be very welcome.

We are interested in embedded library services in the research context as, “If we are truly to be where the user is and to be user-centric, we need to be embedded” (2). Informationists are “in-context information specialist[s]” (3) and there are many examples in the literature of successful informationist programmes and the benefits on the research groups with whom they work.

A wide variety of research support services were mentioned by Informationists interviewed and confirmed in the literature, covering most aspects of the research lifecycle. These include development of ontology tools, copyright and open access support, systematic review support, bibliometrics work on altmetrics and research impact, research data management, text and data mining support, data visualization, and reference and personal information management support.

Articulated benefits of embedded or informationist services for researchers include reduced waste in biomedical research (by undertaking and supporting comprehensive and rigorous literature searches), improvements to researchers' own search and data handling skills, improved grant applications, time saving and workload reduction.

Our informationist interviewees reported the need to work closely with researchers to assess needs, develop appropriate tools and services, and should therefore be embedded with research teams. The literature supports this. Informationists interviewed reported numerous challenges to running successful services, including prioritising activities, identifying user needs, and ongoing promotion.

From the literature (4, 5, 6, 7, 8, 9), we identified a list of twelve potential services that could be provided to BRC staff to discuss with our BRC interviewees.

1. Bibliometrics (e.g. for research evaluation, impact factor calculations)
2. Bioinformatics resources (e.g. NCBI databases) and tools
3. Collaborative network co-ordination (e-science, virtual research environments)
4. Copyright policies
5. Grant writing
6. Literature searching (e.g. for systematic reviews)
7. Network/systems support for translational research
8. Open access publishing and deposit requirements
9. Reference management/personal information management support
10. Research data management (data organisation/description/stewardship of data collections/shared data and open data requirements)
11. Reviewing, editing and co-authoring articles for publication
12. Support of interdisciplinary research

BRC interviewees were mostly positive in their perceptions of all twelve of the activities or services that an informationist could provide to their teams and most of the interviewees saw a role for an

information or library professional assisting their team with at least some of the twelve specific activities discussed. The most frequently highlighted areas of support flagged were literature searching (16 mentions), RDM (12 mentions), and reviewing, editing, and co-authoring articles for publication (12 mentions). Other areas of support with significant multiple mentions (mentioned by more than seven interviewees) included bibliometrics, bioinformatics, copyright, grant writing, support for open access, reference management, and support for interdisciplinary research.

Further, our work identified a series of reported barriers to accessing information support which the literature and our interviews suggest could be addressed by information staff embedded in research teams. They can promote and improve awareness of library services (1, 10, 11), assist with access to papers and online resources (12), provide specific skills training (12, 13, 14, 15, 16, 17, 18), and save researchers' time and effort (19).

Researchers interviewed from four of the twelve Themes were very vocal in their support of having an informationist or embedded information professional join their research teams. Albeit, one with the caveat, "...certainly some or all of these would be very helpful. Whether we generate enough of this work, as a team, to have someone there all the time, I don't know. So I suppose it's one of those things that once it becomes...once there is someone who is able to help with these things, they will be used more and more and their role will grow" (BRC-R11).

Amongst others interviewed there was more mixed enthusiasm for an embed information support post. However, even in many of these cases, a need for assistance was articulated in specific areas. Some interviewees reported that they currently had staff in their teams already to perform some of the activities, particularly literature searching, complying with open access publishing and deposit requirements, and grant writing. Interviewees were satisfied with the staff who were currently undertaking the specified "informationist" activities, (perhaps unsurprisingly, especially the interviewees were who were already performing these services for their teams).

Nevertheless, these interviewees still expressed a need for information support in other areas. For example, one researcher said that whilst a colleague performed all of the other nine activities for their team (BRC-R13), she wanted help specifically with literature searching, collaborative networks, and support of interdisciplinary research. Similarly, another researcher from a different Theme was in favour of receiving help with Bioinformatics ("...there's a plethora of wealth...we don't tap into that"), while "the rest of these...we do...self-taught" (BRC-R8). One Researcher was in favour of receiving specific support in the form of training about RDM, bioinformatics, grant writing, and Collaborative Network Coordination (BRC-R9). Researchers at our third focus group were in favour of receiving systematic review training (BRC-R16 and BRC-R17).

The Research Support staff were in favour of the library service providing support specifically about "bioinformatics resources" (BRC-RS5; also BRC-RS6), or for "systematic review training", and training in reference management programmes for staff who cannot attend sessions held by the University's IT Services (BRC-RS8). Advice or instruction in collaborating and working "with different people who use a different language", those coming from different specialties, was welcomed by BRC-RS3, along with support specifically for literature searching, copying, open access, support for interdisciplinary research, and bibliometrics.

The gaps in expressed, or perceived, needs which are not undertaken by other staff in the team were bioinformatics resources and tools, RDM, and support of interdisciplinary research. This data suggests that, at the very least, the library service can play a key role in providing targeted training to meet these information and training needs, either from the library or in the form of embedded help from library or information professionals.

Only one Senior Researcher was negative when interviewed about the informationist concept. The reservations expressed by some other interviewees about the range of informationist activities that could or should be undertaken were due to: lack of knowledge; lack of awareness of recent changes (e.g. open access, copyright); perceptions that another part of the BRC was or should be responsible; amount of specialist domain knowledge required for the activity; and the perceptions that some of the activities are integral to being a successful researcher (e.g. literature searching).

This perhaps reflects some uncertainty amongst interviewees of library staff's current skill sets but also flags some areas of required library staff training and development (see relevant section below). There is therefore positive evidence that the research informationist role is applicable and welcome in the Oxford context and the BRC for at least some of the Themes. It also provides further evidence to inform proposed actions for enhanced service delivery and enhanced communication to Oxford BRC researchers and staff from the library service.

Proposed Actions

- A pilot eighteen-month project to **embed** a member of staff with one or more of the Themes which were receptive to the informationist idea. This follows a precedent study from Cambridge in a Department of Engineering team (1) and would provide valuable additional data to evaluate the impact of the informationist role in a health care/biomedical research context.

See also **Proposed Actions** in the sections above and below.

4.3 Core and additional staff skills and training

I'd be happy to delegate stuff completely if I knew that that person had the right skillset.
(BRC –SR3)

It is clear from the data that core informationist skills vary according to the research setting and depend on the way the service has developed. However, there are a common set of “core” skills and knowledge required.

Our study highlights a large number of examples in which informationists work in support of research activity and where specific skill sets and attributes are required as a consequence.

Desk research reviewing the services provided by our peer institutions also flagged areas of potential development for library services in support of BRC and other health care researchers in Oxford.

From our interviews with Oxford BRC-funded staff we found a very similar picture. Assistance was broadly welcome with every stage of the research lifecycle. The most popular of the twelve cards used in the interviews and focus groups was the one for literature searching services, then RDM, bibliometrics, reference management, and assistance with copyright. The next five services of interest, in terms of popularity, were bioinformatics, reviewing and editing assistance, grant writing support, open access assistance, and support for networks and interdisciplinary research. Only one Senior Researcher was not keen on having an informationist join their research group, although they did see a role for an informationist in cataloguing their data to aid storage and retrieval.

BRC-R11 commented that “...*I imagine if there was someone who had this skill set* [author’s italics], then they would be used more and more. I think it’s knowing someone’s there and also it’s always a bit awkward asking someone else to do something that you can do [yourself]...”.

BRC-SR3 said: “...I think library services should be much more involved in, like, the active research...Well, you see that’s it, if you were to tell me you could do all of this now, I’d be like “that’s amazing”, I’d get you on board now.” They went on to say that “*I’d be happy to delegate stuff completely if I knew that that person had the right skillset*” [author’s italics].

It should also be noted that reservations were expressed in some cases by some of the interviewees about the range of informationist activities that could or should be undertaken included due to the skills and knowledge that they felt would be required in some areas.

All of this, therefore, has potential consequences for the skills development of library staff as we review our service offer to the research community in Oxford.

Health and biomedical library staff in Oxford already possess an impressive range of skills that fit well with the information requirements of our research community – for example: literature searching; teaching and training; the core and more advanced concepts of evidence-based health care; bibliometrics; open access publishing; and reference management. Many of these align with the core skills required of informationists highlighted in this report.

However, key areas of new skills development, or areas where existing library staff skill sets may need further development, identified in this work include:

- research data management
- impact and research evaluation support (beyond bibliometrics)
- bioinformatics

- copyright
- grant writing
- publication support
- domain knowledge.

Core informationist skills vary according to the research setting and are depend on the way the service has developed but the literature does flag a common set of “core” skills and knowledge required. There is no single career route into an informationist post. Some research informationists may have scientific or clinical qualifications, or may need to earn them, but others may acquire the necessary knowledge and expertise by learning on the job.

Key personal attributes emphasised in literature and in our interviews include importance of team working skills, interpersonal skills, scientific curiosity, creativity, and a willingness to take the initiative to develop new services.

Informationists all seem to be benefit from some education and training to gain additional expertise. Education provision may be formal or informal, external or internal, and may involve domain knowledge (e.g. life sciences, and/or computer science) or technical skills (e.g. research data management).

The future trends for informationist services in the US suggest that they will continue to develop specialist RDM and Bioinformationist services for research groups.

It is clear from the evidence of our interviews with LIS professionals and researchers, as well as from the literature, that more than just technical skills are required. BRC researchers interviewed consistently suggested that the best people to promote library services are the librarians (or information professionals, informationists), going out and about and keeping in regular contact with individual and groups of researchers. This is also reflected in the relevant literature and in interviews with informationists themselves. This underlines the importance of new staff recruited to BHCL having strong communication and other interpersonal skills as well as the importance of existing staff continuing to develop these skills, and their willingness to ‘network’ with the research community.

Proposed Actions:

- To update and implement the BHCL skills audit toolkit to include further development of skills in RDM, publication support (including grant writing), research impact (beyond bibliometrics and altmetrics), and copyright.
- To undertake further scoping work on the bioinformatics support already available to BRC funded and other MSD researchers across Oxford and potential opportunities for library support/collaboration in this area.
- To provide all BHCL and RSL Outreach and Subject Librarians with access to additional training as required in “soft skills” such as influencing, networking, assertiveness, emotional intelligence and interpersonal communications.
- Enhance opportunities for library staff adopting a more embedded approach, to develop their subject domain knowledge and their appreciation of research culture and norms.

4.4 Presentation and awareness of services

"I didn't know that sort of service existed actually."

(BRC-R11)

Our study reveals several barriers that prevent or hinder BRC staff's access to information or support. For example, for a significant number of respondents this includes a lack of awareness of the services available to them, or issues around the time and effort required to find information or learn about library services/resources. "I didn't know that sort of service existed actually."

Given the seniority and length of tenure of some of the staff interviewed it is clear that there is work to be done to raise and to maintain an awareness of library services amongst Oxford BRC and other biomedical/healthcare researchers.

In order to raise awareness about library our interviews with BRC staff and informationists and the literature suggests that short, simple messages about services should be targeted to specific groups through a variety of methods. Based on the review of core services offered by other institutions and their webpages, there is also some work to be done in Oxford on presenting more clearly on our webpages the full range of support and services made available by the Bodleian to BRC-funded (and more widely to other MSD) researchers.

BHCL already undertakes activities like those noted above, but it is clear that the library service needs to improve its publicity and awareness raising activities.

Our interviewees consistently suggested that the best people to promote library services are the librarians (or information professionals, informationists) themselves. Areas of suggested development, which are expanded on in more detail below, include redevelopment of online and traditional publicity materials. However, based on past local experience, and very clear from the evidence presented in these results, is a requirement to expand and improve on *personal* contacts and *personal* marketing of our services by library staff directly with researchers, as well as the further development of "champions" in the research community and ways of expanding word-of-mouth publicity.

For example, we must include links to library webpages on departmental websites, and in in emails sent to departments via their administrators (20). We can market our services through workshops and induction sessions provided by our Outreach and Subject Librarians, and consider using social media to reach doctoral students and postdoctoral researchers (following Tomaszewski, 2012 (21)). This could include the use of YouTube and Twitter, as well as "vox pop" videos or podcasts. Posters are also still popular (22), as are other print and online materials (23). Our participants also suggested sending out newsletters (as PDFs, with embedded links, which can also be printed as posters for staff areas), library materials to be included in induction packs for new starters, welcome events, and recommended that our librarians talk to research staff at any and every opportunity, to improve word-of-mouth communication (including presentations in departments).

Proposed Actions:

General:

- Task the BHCL publicity group to further develop traditional (print) and online marketing materials aimed at BRC and other MSD health care researchers with focussed messages on

how the library can help specific aspects of their work (e.g. open access, impact, public engagement).

- To include a range of new publicity materials (posters, video clips, news items and introductory emails) highlighting Bodleian research support including “stories”/“case studies”.

Further develop the Bodleian’s social media and Web presence in support of BRC and MSD researchers:

- Start discussions with colleagues across the Bodleian on a more uniform online and offline approach to (and presentation of) support for “Scholarly Communication”.
- Redevelop the BHCL’s NHS and MSD webpages with a clearer focus on research support, to include:
 - Updated/new Bodleian online guides (LibGuides) and webpages on:
 - publishing support (to include support available from elsewhere in the University);
 - copyright for BRC-funded and other MSD researchers (and update and position a more prominent link to the Bodleian copyright webpages);
 - include impact support beyond altmetrics and traditional metrics;
 - systematic reviews;
 - research data management
 - support for public engagement with research.
 - User-test a “Scholarly Communication” style section on the new webpages for presenting services such as support for RDM, OA and impact/bibliometrics.
- Work with BRC and MSD communications staff to:
 - embed information on library support for researchers within relevant BRC/MSD webpages;
 - insert frequent library features in relevant newsfeeds and online newsletters (e.g. a library feature in “Lab of the Week” in the MSD newsletter);
 - Ensure regular retweeting of library messages aimed at the research community;
 - Ensure a link from key BRC, MSD and OUH webpages (e.g. MSD Researcher website, Oxford BRC webpages, MSD skills development portal, MORE) to the new Bodleian health care research support webpages.

Personal/Face-to-Face

- Develop new (brief) print and electronic introductions to library services tailored by subject for all new BRC and MSD staff induction packs via departmental and Theme administrators.
- Undertake a focussed programme of outreach to by Subject and Outreach Librarians to establish/re-establish personal contacts with key MSD departmental and BRC Theme contacts/potential champions including: MSD departmental administrators, communication leads, REF/OA leads, research facilitators and PER coordinators; BRC theme liaisons and communications staff; Directors of Graduate Studies and associated administrative staff; departmental graduate student and post-doc groups and representatives.

- Increase attendance by Subject and Outreach Librarians at key MSD and BRC researcher meetings, local conferences and relevant departmental and Theme events (e.g. seminars, away days, open days, grand rounds).
- Establish a regularly updated central spreadsheet of regular BRC theme and MSD departmental meetings, seminars, conferences, and associated events.
- Review and strengthen links with key support units to the BRC and the MSD (e.g. Oxford Graduate School, OUCAGS, and the Oxford Research Network).
- Develop an agreed 'standard template' presentation for all MSD Subject and Outreach Librarians supporting researchers.

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Study Report

6 Introduction

In response to the increasingly complex information needs of health care researchers, a rich and diverse spectrum of services is being offered by libraries in biomedical and translational research institutions across the world. In the USA, the National Institutes of Health and various other institutes have long established “informationist” (or Information Specialist in Context) programmes and posts providing research and knowledge management services for biomedical research. For example, informationists and other library professionals support researchers funded by the Clinical and Translational Science Awards programme and other translational science institutes at each step of the research process, from grant-seeking to final publication. However, the development of this kind of informationist role has been more limited to date in the UK and elsewhere in Europe.

Oxford is a world-leading centre for health care and biomedical research in all its forms. The Bodleian Health Care Libraries (BHCL) services work with NHS and University of Oxford Medical Sciences Division researchers at all levels, providing many of the services recognized as being key to supporting biomedical researchers. We were keen to explore further how our library services can be more embedded within, and better support the workflows of, Oxford’s biomedical and translational research community and the central services of the Biomedical Research Centre (BRC). Our study focused on Oxford BRC-funded scientists but, as well as being applicable to other biomedical researchers in Oxford, the outputs will also be of interest to the wider UK library community supporting biomedical and translational research centres.

6.1 Aims

In this study we aimed to identify the key services that should be provided to health care and biomedical researchers and to explore whether an embedded model, similar to that of the informationist role in the USA, would be appropriate for the Oxford context.

We carried out a multi-method study with the objectives of identifying:

1. The core services that should be part of the standard offering to BRC-funded and other researchers.
2. a) Gaps in the current library service provision and, b) key areas of knowledge management/information support where a more embedded information specialist could provide support to biomedical researchers and the BRC.
3. The specific applicability of the research informationist role to the Oxford context and the BRC.
4. The core additional skills and knowledge required of library staff to provide more embedded support to the BRC and within the wider Oxford/UK biomedical research context.
5. How the library service can better present, and make the Oxford biomedical/health care research community more aware of, the services available.

6.2 Context

The Oxford Biomedical Research Centre (BRC) is based at the Oxford University Hospitals NHS Foundation Trust and is run in partnership with the University of Oxford. “BRCs are part of the Government’s initiative to improve the translation of basic scientific developments into clinical

benefits for patients and to reinforce the position of the UK as a global leader in health care related research.” (2).

This project overlapped with the commencement of the BRC3, the third phase of funding for 2017-2022, with a renewal and expansion of the research themes from 14 to 20 (Figure 1.1).

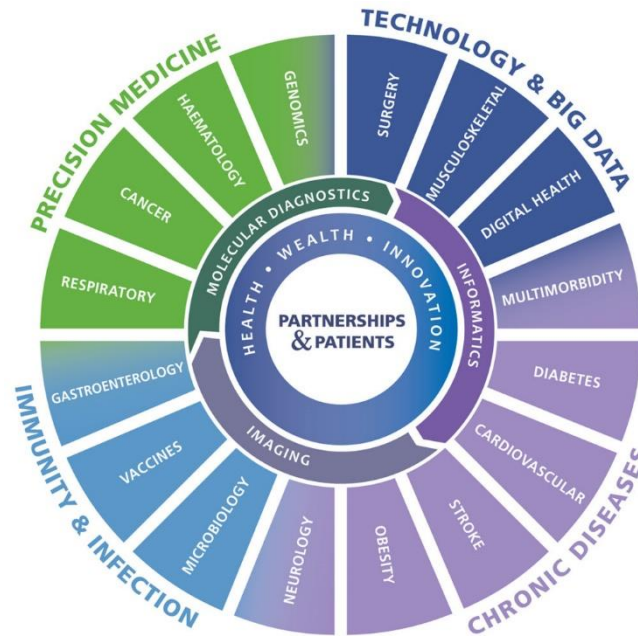


Figure 1.1: Oxford BRC research themes (2)

During our research project, one Senior Researcher whom we interviewed described the BRC3 very simply: “there are 16 clinical themes, three underpinning themes (Clinical Informatics & Big Data, Imaging, and Technology & Digital Health), and a theme about Partnerships for Health, Wealth and Innovation. This latter theme is about providing specialist support around ethics, statistics and economics, research methodology, patient and public involvement, impact and technology transfer, as well as researching the BRC itself to understand how it works and how it can work better” (BRC-SR2). Another Senior Researcher explained that the BRC “tends to fund parts of PIs and then they’re meant to go off and get funding from other charitable organisations or MRC or whatever to fund researchers” (BRC-SR1). This means that not many individuals are 100% funded by the BRC, and often staff are funded by a range of funding bodies. A research support staff member who is relatively new in post told us that it has taken her a while to understand what the BRC is and how it operates: “...it’s understanding where the BRC fits in to all the other sort of health research organisations in Oxford...we do need to be partnering with them, and working better” (BRC-RS4). Issues relating to collaborating, “partnering” and networking are discussed in the literature around translational research.

The Bodleian Health Care Libraries (3) is the main section of the Bodleian Libraries providing support to the clinical departments of the University of Oxford Medical Sciences Division and to the Oxford University Hospitals NHS Foundation Trust.

BHCL operates across four hospital sites with an active programme of support and outreach to its NHS and University clientele – clinical staff, students, and researchers. The service works closely in partnership with colleagues across the Bodleian to support research activity including services such as

extensive collections of online resources; group and one-to-one information skills training and consultancy sessions; a literature searching service for researchers and clinicians; help and advice on impact; support for open access publishing including a research archive (the Oxford Research Archive, ORA) and support for article processing charges (APCs); and embryonic support for Research Data Management (RDM).

BHCL is part of the Bodleian Libraries at the University of Oxford - the largest university library system in the United Kingdom. It includes the principal University library – the Bodleian Library – which has been a legal deposit library for 400 years; as well as 28 libraries across Oxford including major research libraries and faculty, department and institute libraries. Together, the Libraries hold more than 12 million printed items, over 80,000 e-journals, 1.35 million ebooks, and outstanding special collections including rare books and manuscripts, classical papyri, maps, music, art and printed ephemera.

7 Methodology

We used a multi-method approach, combining a critical synthesis of the literature with qualitative research (interviews and focus groups). We also looked at job descriptions for informationist roles in the USA, and at services listed at comparable UK and international BRC and higher education (HE) websites to deepen our understanding of the role and to compare and contrast the different services offered.

7.1 Literature Search

7.1.1 Search strategy

We constructed three search strategies, which covered: informationists and library and information staff performing informationist activities (e.g. data management, bioinformatics, literature searching, Scholarly Communication, copyright, etc.); library and information services provided to biomedical researchers; and the information needs and information seeking behaviour of biomedical researchers. Where possible, we used thesaurus terms as well as free text terms, truncating words where relevant, and including variations such as “project lifecycle” or “project life cycle”. We limited to English language publications only. All three search strategies were applied across seven databases (see Appendix 1). The results were de-duplicated in EndNote prior to study selection.

7.1.2 Study selection

The following key themes were identified from the literature search: information needs of biomedical researchers; informationist/informatics services; service evaluations; descriptions of services; embedded services; education and training; and research data management. Additional relevant references were included from papers identified by team members. The decision was taken to limit the literature review mainly to sources from 2010 onwards because of the pace of change in the library and information services sector, and due to the limited resources available for this project. A total of 127 sources were included in the final selection. Relevant earlier evaluations were also included.

7.2 Interviews with LIS staff

We sent out an email via three mailing lists (the University Health and Medical Libraries Group, the mailing list for medical librarians in the UK [lis-medical], and the list for members of the European Association of Health Information Libraries) to invite “library colleagues who are working in a more embedded way with researchers or who are otherwise delivering services to their research communities in less ‘traditional’ ways” to participate in the project. Eight self-selected respondents

agreed to a semi-structured interview by telephone. Three additional respondents replied to the questions by email. The interview schedule explored participants' reasons for starting a service for biomedical researchers, how they set up the service, how they identify and respond to researchers' needs, promotion of the service and the main challenges encountered (see Appendix 2).

Notes were taken by hand to record all data from the telephone interviews. The notes and email replies were analysed in NVivo using a thematic analysis approach (4).

7.3 US informationists: emails and online focus group questions

We emailed those who had contributed to conferences of the Medical Library Association 2014-16 (5) with the same invitation as we sent to the UK mailing lists. We had only one response, and so targeted an additional five informationists with different specialist expertise (data management, bioinformatics, public health). The anonymized responses from the four respondents were entered into NVivo for coding and analysis.

7.4 Interviews and focus groups with researchers funded by the Oxford BRC

We developed and piloted an interview schedule (Appendix 5), which was adapted slightly for the focus group, to explore researchers' roles within the Oxford BRC, their information needs and behaviour at different stages of the project lifecycle (using the critical incident (7) technique to elaborate on this), the training they had received, and whether it would be useful to have someone join their team to provide support with one or more of twelve possible informationist activities. A further question explored how library staff could communicate with them and promote services.

We used a purposive sampling method (8), to ensure that a range of opinions could be gathered. The Project Lead contacted the Oxford BRC Theme Liaisons at meetings (e.g. the BRC Operations Meeting), using these contacts both to organise interviews or focus groups with the Theme Liaisons themselves and with their staff. Individuals were also invited to be interviewed using an email list supplied by the Oxford BRC Clinical Research Manager. Where possible, interviews were recorded and then transcribed in full. Alternatively, extensive notes were taken and the interview written up soon afterwards. Again, the notes and transcriptions were analysed in NVivo.

We interviewed 27 individuals, and spoke to 15 in three focus groups. Overall, we spoke to 42 people from 12 Themes (Table 1) with some focus groups limited to one theme, and others seeking views from a range of roles across several themes.

Table 1: Oxford BRC interview and focus group participants

Role	Number of participants
Senior Researchers (Theme leads or Co-leads)	7
Researchers (DPhil Research Students, Postdoctoral Researchers, Clinical Fellows, Senior Researchers, Research Biochemists, Research Nurses, Research Associates, Theme Liaisons, Principal Investigators)	20
Research Support staff (Statisticians, Laboratory Managers, Research Assistants, Training Managers, Information Governance Managers, Personal Assistants, Bioinformaticians)	15

All responses have been anonymised in this report.

7.5 Website searches: informationist job descriptions

Relevant job descriptions were identified following a range of searches using the terms “informationist”, “informationist jobs USA” and “informationist jobs America”. Sources searched included: the MEDLIB-L mailing list archive (9); Google; the Jobs section of the Medical Library Association website (10); and the American Library Association Joblist (11). At the end of this exercise, we had 18 job descriptions from 2013-2017 to analyse using an Excel spreadsheet.

7.6 Website searches: Library biomedical research support

A review of relevant library webpages was undertaken to identify the services provided by the library services supporting the world’s leading biomedical research Universities outside of Oxford. Sixty-four institutional library webpages were initially identified to be reviewed. These included the libraries supporting all of the major international centres of biomedical and health care research.

The institutions reviewed were those ranked as the top 50 institutions (when ranked by research score) in the *Times Higher World University Rankings 2016-2017* by subject: Clinical, Pre-Clinical and Health. To this top 50 were added the library services supporting UK HE biomedical researchers in the *Times Higher* top 50 to 100 as well as those services supporting UK NHIR BRCs that are not otherwise included in the aforementioned categories. In recognition of its unique place in biomedical research support, the library service of the US National Institutes of Health was also included in this review. A full list of the services reviewed can be found at Appendix 7.

Each institutional webpage was reviewed by a member of library staff looking at services available to biomedical researchers as advertised on webpages of the institute’s medical library (or similar) and the webpages of the main University library service. For example, in the case of University College London, the main UCL library webpages were reviewed in addition to the webpages of the various medical/health care libraries within UCL library services.

Each institutional webpage was reviewed against a pre-set list of topics and data recorded on an Excel spreadsheet. This list was based on a breakdown of the services available at Oxford and from an initial review of the services offered by five peer institutions plus an “other” option.

Given their specific parallels with Oxford, in addition to the work above, an invitation and two follow up emails with an invitation to complete a short survey (<https://www.surveymonkey.co.uk/r/96SVNKZ>) were sent to the HE and to the NHS library service affiliated with the Trust or other organisation hosting each UK BRC.

7.7 Ethics

Advice was sought at an early stage on any requirements for research ethics committee, MHRA or NHS approval. The response from the Head of the University of Oxford Clinical Trials and Research Governance team was that, on consideration, no ethical approval was required. All of the interview and focus group participants funded by the Oxford BRC signed an informed consent form, which can be found in Appendix 6, as supplied by one of the external consultants in information studies research.

7.8 Limitations

The limitations of the research mostly concern those relevant to qualitative research. We use the terms credibility (similar to internal validity), transferability (similar to external validity), dependability (similar to reliability) and confirmability (similar to objectivity) as well as criteria for authenticity.

Purposive sampling ensured that a range of themes and job roles (BRC staff), or informationist roles/settings (North American informationists and the UK/European information specialists) were included in the sample. Inevitably more time would have permitted interviews or focus groups with more people, but the extensive literature review, and interviewing method helped to enhance the transferability of the findings to both the BRC setting and elsewhere.

The report has included excerpts from the interviews to ensure that the research findings and conclusions are transparent and defensible. However, anonymization of interviewee comments also had to be ensured. On aspects of authenticity the purposive sampling, and use of both interviews and focus groups, attempted to represent different viewpoints of BRC staff, and different views were obtained.

Due to limitations of budget and local staff expertise, only the English language versions of webpages and only articles published in English were reviewed as part of this project.

This meant the exclusion of all studies in non-English languages and meant that several institutional Webpages were not renewed. In five cases the English language version of the library's webpages did not provide sufficient information for a full review to take place and in one other case the organisation itself was not a large scale HE institution and had only very limited library services. Those institutions were therefore excluded from the analysis of the review. It should also be noted that for several other services in non-English speaking countries extensive English language sections were provided on their webpages but it was obvious that the native language version of the library webpages contained more detailed information. This therefore introduces an inherent bias towards the native English speaking world into the study.

It should also be noted that the results of the Webpage review are based *solely* on the information presented and identified by Bodleian staff on the public facing Webpages made available by each institution.

The credibility of the findings will be assessed through the future sharing of the research with the BRC staff and health librarians elsewhere through publication. The main researcher was working part-time in the research role. The advantages included a general awareness of the BRC setting, but the disadvantages included prioritization of work/research commitments, the difficulty of learning and doing research as a practitioner, and the inevitable stereotyping of the researcher with the known roles associated with existing library services. To minimise some of the consequent problems with dependability and confirmability, the external consultants assisted with the screening of the literature searches, and the coding of the interview and focus group data.

8 Findings

8.1 Library services provided to biomedical researchers

KEY MESSAGES

There is a broad uniformity of standard library services offered to biomedical researchers. These include: a range of physical facilities; print and online content; document delivery services; “branded” programmes of training offered to researchers; variants of subject/faculty/departmental liaison librarians providing one-to-one consultations (as well as other services); support for reference management; and support for literature searches.

Almost all of the libraries reviewed present their services specifically for researchers in researcher specific sections of their webpages – many structured around the different stages of the research cycle.

At some institutions (especially in North America), consultations and training provided in support of researchers cover topics such as support for bioinformatics, research data management, and copyright support/training.

Even where these more advanced consultation options are offered there are numerous examples of hybrid roles - combining elements of the roles of liaisons and functional specialist or experts.

Many services present their publishing support, open access services, research data management (RDM) support, and bibliometrics support online under the general heading of “Scholarly Communication” or variants thereof. Core components of this offering include:

- Library-based support for open access publishing (OA) and RDM.
- Support for bibliometrics, altmetrics and other aspects of measuring/tracking impact.
- Support for copyright.
- Other support such as advice on where to publish, manuscript support, writing support, ORCID support, and support for local research networking and discovery tools.

Support ranges from basic online guides through to institutional repositories and teams or staff or physical units supporting these activities.

The vast majority of services reviewed provide support for systematic reviews and many provide “tiers” of services available, often accompanied by the levels of recognition expected in the final outputs and/or funding required.

Support for bioinformatics is provided at a minority of American library services.

No significant areas of additional possible support were identified from our review of library services associated with the other UK BRCs.

The “standard” range of library services and examples of more enhanced library support provided to biomedical and healthcare researchers globally was investigated using a three-strand approach: a literature review; a review of relevant library webpages; and a survey of librarians supporting the other UK BRCs.

8.1.1 The Literature

We reviewed the recent literature about health sciences librarianship to discover the “core” or “standard” range of library and information services available to biomedical researchers from Higher Education (HE) libraries. As the Bodleian Health Care Libraries are an HE library service, and in the absence of a blueprint set of services which are recognised internationally as essential for this user group, we consulted the literature in order to ascertain what that blueprint looks like.

There are general overviews (including papers by Glenn and Rolland (2010) (12), Cooper and Crum (2013) (13), Cain *et al.* (2016) (14)), as well as discussions of specialist services (literature search services (15); systematic review support (16); support for grants and funding proposals (17); research data management (RDM) and training (18-21); open access and Scholarly Communication (22-24); and embedded services (25).

In their 2016 study about the support provided by Health Sciences Libraries for health and biomedical researchers, Cain *et al.* divided the information services into four core categories:

1. Information Discovery and Access (how accessible library collections, including databases, are for users);
2. Expert Information Services (including “information consultation services”);
3. Data Management Services (including “information planning to ensure compliance” with funders’ mandates);
4. Digital Capture and Preservation (including “open access electronic publishing”, and institutional repositories) (14).

Alternatively, the core services discussed by Glenn and Rolland (12) in their 2010 review of the involvement of librarians in biomedical research are: “Original research and analysis, including in-depth literature searching”; “Bioinformatics support”; “Grant and manuscript writing support”; “Teaching and technical support” in the form of information literacy training or “seminars on using biomedical research databases”; and “Offering traditional library services in non-traditional ways”, as librarians have shifted from providing print and face-to-face services to using online means of communicating with service users. These authors write about the involvement by librarians “in all phases of biomedical research”, throughout the research or project lifecycle, from pre-proposal to the end of projects (12), which corresponds to Cain *et al.*’s categories of the library services provided for each stage of the research lifecycle. Cooper and Crum’s 2013 systematic review about the change in activities and roles of health sciences librarians concurs with this analysis by Glenn and Rolland, particularly in relation to new specialist “embedded” roles and activities for librarians, embedded within specific departments to perform specific tasks in roles such as informationist or bioinformationist (13). (These roles will be discussed in more detail in Section 8.2.1).

In addition to these services, a recent analysis of health sciences libraries in the US by Epstein (2017) (26) demonstrates that physical library spaces still have a role to play, despite the “decline of print collections”, for “collaboration and technological innovations”. This is an international trend in health science librarianship in general, as the shift to digital journal collections has created a need to “redesign spaces”, as more people use physical library spaces for their “professional development” (27).

The main HE library services provided to biomedical researchers can therefore be outlined as follows:

- physical library spaces (26-29)

- online and physical journal, book and database collections (26, 27, 29)
- literature searching support (12, 15)
- systematic review support (13, 16, 30)
- support for grants and funding proposals (12, 13, 17)
- information literacy training and other teaching sessions – face-to-face and online (12, 28, 29)
- RDM and data training (13, 18-21)
- open access and Scholarly Communication support (12, 22-24)
- bioinformatics support (12, 13, 31)
- embedded services (12, 13, 25, 29-32).

8.1.2 The Webpage Review

Our review of the websites of comparable UK and international higher education (HE) biomedical and health care libraries was undertaken to develop our understanding of the range of services and facilities available to biomedical researchers in our peer institutions.

The review aimed:

- to review the range of library services delivered in support of biomedical researchers at Oxford's peer institutions;
- to identify, if possible, the base level/ "core" service offer provided at all or at the majority of institutions;
- to compare the services provided by Bodleian to Oxford health care researchers with those provided at our peer institutions;
- to identify any "value added" services that might be of value to Oxford BRC and other health care researchers to review further (remotely or in person).

The results of this review are summarised below. A fuller report is available on request.

"Basic/Core" Library Services

As reflected in the literature reviewed (above), the review demonstrated that there is a broad uniformity of "basic/core" library services offered to researchers across the vast majority of libraries, and these are similar to those available to biomedical researchers at the BRC and the University of Oxford. These include, a range of physical facilities; print and online content; document delivery services; "branded" programmes of training offered to researchers; and variants of subject/faculty/departmental liaison librarians providing one-to-one consultations (as well as other services).

Support for reference management is ubiquitous across all of the services reviewed including: online guides; workshops and training sessions; individual help and advice; and downloads of locally licenced packages. Many of the services offer branded training programmes aimed specifically at researchers and research students

Reflecting some of the more advanced services they provide, at some institutions (especially in North America), consultations and training provided in support of researchers cover topics such as support for bioinformatics, research data management, and copyright support/training.

It is also clear that even where these more advanced consultation options are offered they are not all provided by all liaison staff in the relevant library service. There are numerous examples evident of –

as noted by Jaguszewski and Williams (2013) – “a more hybrid model combining elements of the roles of liaisons and functional specialist or experts” (33).

Beyond “Basic/Core” Library Services

Scholarly Communication

Presentation

Almost all of the libraries that were reviewed present their services specifically to researchers in particular sections of their webpages, with many of them structuring these around the different stages of the research cycle. A significant number present their publishing support, open access services, research data management support, and bibliometrics support online under the general heading of “Scholarly Communication”, or variations on that term. A minority have teams or physical units delivering this support – e.g. the *UNC Scholarly Communications Office*; the *University Library Research Services Unit* at Sheffield, and *The Digital Scholarship* group at University of Pennsylvania.

Open Access and Research Data Management

Within the Scholarly Communication area it is clear that library-based support for open access publishing (OA) and research data management (RDM) are now part of the core offering from higher education libraries to their research communities.

Support for OA ranges from very basic online guides through to in-depth advisory and training services, to management of institutional repositories. A minority of library services provide infrastructure or other support for local open access journals.

RDM support by library services varies in similar ways in terms of the levels of support offered and is at times delivered in collaboration with other departments/stakeholders on campus (e.g. research or IT departments). At a minority of the sites reviewed RDM support is led by groups outside the library. Support ranges from introductory libguides through to training on data management plans services to advisory services on metadata to data repositories.

Impact/Bibliometrics and Copyright

The vast majority of library services reviewed offer help and advice at some level on bibliometrics, altmetrics and other aspects of measuring/tracking impact. However, several of our peer institutions provide far more tailored and in-depth support. This includes actual or virtual units and specific posts based in their medical or main libraries whose support goes beyond “traditional” metrics.

Only eight of the 58 services reviewed did not include a section on copyright enquiries and support on their webpages. This support can be at a fairly basic level and more about signposting at some library services (as at 21 of those 58 services reviewed). However, in-depth support and advice on copyright is provided by over half of the library services studied. This includes joint initiatives between the library and partners elsewhere on campus. A small number of services reviewed provide copyright training sessions.

Other Support for Scholarly Communication

Over and above the areas of support outlined above, many of the libraries reviewed also flag support for other aspects of publishing and scholarly communication. These include: providing guidance on how to identify the best journals in which to publish; offering training and advice in writing for publication and publishing; offering assistance with manuscript preparation; advice on formatting affiliations or addressing recommendations; support for ORCID registration; and support for VIVO, Pure and similar local research networking and discovery tools.

Systematic Reviews

The vast majority of services reviewed provide support for systematic reviews. At its most basic level this is in the form of online web guides in support of clients undertaking searches for systematic reviews themselves. The majority also provide librarian help and advice (which can range significantly in its depth) and training or workshops in support of systematic reviews.

A significant minority of institutions provide advanced support – in some cases up to the offer of in-depth librarian support as a full member of the systematic review team. Many provide menus of the “levels” or “tiers” of services available, often accompanied by the levels of recognition expected in the final outputs (e.g. acknowledgements or co-author credits). Reference is at times made to the requirements for authorship and contributorship of the International Committee of Medical Journal Editors (ICMJE) and to formal agreements between the library/librarian and the researcher, reflecting respective responsibilities and obligations. Some of the services mention or make statements that reflect capacity management and/or charges for the most advanced levels of support.

Bioinformatics

While a significant number of American library services provide support for bioinformatics, none of the non-US library services that we reviewed, offer even very basic support for this on their webpages. Services offered in the US range from LibGuides or webpages with information and links to in-depth support. This more advanced support includes advice and training as well as specific posts or teams employed by the library to support bioinformatics across their institutions. Some services also offer an array of relevant specialist software and hardware in their libraries.

8.1.3 Other BRC Sites

The results of the survey of other UK BRC library services were rather underwhelming. Of the 40 services in total from whom responses were invited, only nine responses were received, all of which were from HE services. Six of these services reported that they are the main library service supporting their BRC administrators and seven services reported that they are the main library service supporting their BRC funded researchers. Of these only three services appear to be providing their BRC with any specific support.

The data that was gathered from the survey of HE and NHS libraries service affiliated with the Trust or other organisation hosting each UK BRC is consistent with the literature review and investigation of biomedical and healthcare library webpages.

In one case, “alerts and EndNote databases set-up for sets of BRC researchers to help with identifying recent publications by BRC researchers that have acknowledged NIHR funding (I search the relevant PDFs for funding information). This is to support the BRC quarterly reporting. I also provide bibliometric reports as and when requested.”

A second library service reported that they offer support for, “systematic literature reviews publications open access policies, procedures, publications support one-to-one training by appointment”.

The third was more substantial. “We participate in the *REDACTED* BRC education and training programme that runs twice a year. We run Critical Appraisal training as part of this. We don’t have one particular ‘service’ that supports the *REDACTED* BRC instead we provide a range of liaison services, learning & skills services, and research support services to support people working in those BRCs with different aspects of their work. The Research Support team can provide advice to NIHR funded researchers and BRC administrators regarding scholarly publications and research data management, and occasionally do. However the university is clear that the full range of such support – e.g. use of

Pure, provision of OA funds, etc. – is only available to researchers on *REDACTED* University contracts - not those on NHS contracts”.

8.2 What do BRC staff perceive as information and service needs?

KEY MESSAGES

Researchers funded by the Oxford BRC have a range of work needs covering all stages of the research project lifecycle, such as searching for initial literature to start a project, coordination and management, and producing outputs (publications and others “around translational medicine” (BRC-RS2)).

The four most frequently mentioned information needs for all three BRC staff groups interviewed combined are: personal information and reference management; publishing support; literature searching (as an individual responsibility as well as for systematic reviews); and research data management. This finding is reflective of the literature.

From this data, we can see that literature searching was the dominant theme in terms of the information needs discussed by interviewees. We found, as would be expected, that the different staff roles have different information, skills, and training needs.

The Research Support staff reported most often that skills they need are around managing personal information, reference management and use of Symplectic. The second and third most frequently mentioned themes coded for this group were literature searching, research data management (RDM) and governance/stewardship.

For Researchers, the most significant information needs (in terms of frequency of reference and emphasis in interviews) were jointly literature searching (as an individual responsibility), as well as personal information and reference management. RDM was a third major need coded from the responses.

For Senior Researchers, the most frequently cited information need was RDM, followed by: grant writing and proposal preparation; publishing and presentations; coordinating and managing research network activities; and literature searching (both as an individual responsibility and for systematic reviewing).

They seek support and training from sources across the University, and perceive the library as a place to go for training on information management skills. For example, for training on data management skills they look elsewhere, to ‘University’ or NHS courses, or are self-taught. For literature searching skills, they often approach the Bodleian (BHCL), colleagues or managers, or are self-taught.

We interviewed staff from the Oxford BRC and divided them into three staff categories: Senior Researchers, Researchers and Research Support staff. The 20 Researchers came from 11 of the BRC Themes and their work varies enormously. The research groups vary in size, composition and scope. They also vary in the extent to which they collaborate with other Themes. Outputs largely consisted of publications or of other outputs “around translational medicine”, putting bench discoveries into routine use to predict, diagnose, treat, and manage conditions (BRC-RS2, BRC-RS8, BRC-SR1). The Research Support grouping consisted of 15 participants. Personal Assistants are an interesting group because they are often given jobs that are also performed by library staff such as finding bibliometric data, or reference management.

Interviews with Oxford BRC staff from the three categories provided information about the range of their research activities relating to different stages of the research project lifecycle. These ranged from initial exploration (“we’re...trying to get a new project up and running” (BRC-R14)) through to the preparation of papers/reports or the implementation of, for example, a database to track diseases. Several participants indicated that their work involves at least an element of project planning and management and several cited data management activities such as collecting and analysing data sets. When interviewees were asked about providing research support, responsibilities included diary management and management of publication information (by Personal Assistants), data management and data security, and supporting researchers in working with Patient and Public Involvement. Some Researchers and Research Support staff had responsibility for supporting skills-development in other staff. This included providing research skills training and running seminars on open access.

Perceived information needs of biomedical researchers

A hypothesis was that BRC staff would need information at all stages of the research lifecycle in order to produce their intended outputs (63). Two questions were asked in the interviews and focus groups to find out when and why our participants need information. Question 2 was, “Can you tell me about the different stages in the research process where you tend to need to acquire information please? Which stages are the most information-intensive? Where do you find the information you need? Are there things you find frustrating about locating and acquiring the information you need?” We followed up on the ‘frustrating’ angle about finding information with the Critical Incident question (7), asking about “one particular [typical] occasion when you have needed to find information to support you in your work”, and asking for as much description as possible about this one incident.

The responses to these questions revealed that, in order to produce outputs such as papers or algorithms, our interviewees needed information for a total of fourteen different purposes. The four most frequently mentioned needs for all three BRC staff groups interviewed were: personal information and reference management; publishing support; literature searching (as an individual responsibility as well as for systematic reviews); and research data management.

Information was otherwise required for: individual research (to keep up to date); working in a research network; coordinating and managing research network activities; working with colleagues from other themes; translational research; open access publishing and repository related work; statistical and computer applications; and using social media tools.

The majority of interviewees (>40) mentioned literature searching as general information need required for project and protocol planning, to learn about new skills and new fields, and for literature reviews when writing papers. It is also required for grant application writing, for systematic reviews, as well as for publishing and presenting.

Literature searching as an individual responsibility was a very major theme in the interview data. For example, researchers required information on previous experiments to inform project planning (BRC-R10), or for protocol writing (BRC-R14). Two research staff members talked about needing information about a new field. BRC-RS5 went to the Cairns library to find a recent edition of a textbook, and another research support staff member talked about needing information about the BRC3 when they applied for a job (BRC-RS4).

Nine interviewees talked about needing literature searches for systematic reviews, specifically the search results (BRC-SR3) and the translated full text papers. One Senior Researcher described the need for literature searches to inform systematic reviews in order to fund projects (BRC-SR4). Another researcher talked about needing to sit “down with the hard copies” to translate papers in order to

extract the data for a meta-analysis, and spoke in favour of all researchers reviewing the literature “before you start”, such as “people who are planning a trial” (BRC-R7).

When writing papers individual responsibility relating to literature searching also applies. This was discussed by one member of research support staff who said that “...when I first started writing papers that was all quite new and overwhelming um, and then you suddenly realize that possibly your searching skills are not as good as they could be...” (BRC-RS7). BRC-R12 said that they also need information when writing papers in order to find out who has done what, and to try to prove them wrong. Another researcher talked about needing information “to do a more focused literature review for the introduction” of a paper (BRC-R11).

Literature searching was also a theme that ten of our interviewees mentioned in relation to **publishing and presenting**. For example, one senior researcher wanted support with “enabling people to digest information better and the sort of front end of the presentation of our data to the public and stuff like that as well” (BRC-SR4).

Six researchers and senior researchers mentioned the need to access the current literature to support **grant applications and reports**: “It should be basic in all grant writing” (BRC-RS2).

Personal information management was a significant theme, as it was mentioned by 19 interviewees. BRC-R1, BRC-R7 and BRC-R8 talked about using Symplectic Elements to deposit papers. BRC-R7 said “I can search for myself and download it all into my updated CV” in relation to locating references for this singular purpose, whereas the research support staff who attended our second focus group (BRC-RS11 and RS12) said that they needed help with using EndNote to update CVs and manage references. Sixteen interviewees mentioned using reference management programmes to manage personal information, uploading references to Mendeley (BRC-R2), or using EndNote to write “reviews with 50, 100 references, it’s coming into its own” (BRC-R11).

Research Data Management was a theme mentioned by 16 interviewees who referred to dealing with information security, such as the storage of confidential documents, or simply “the storage of data” (BRC-R14). BRC-SR5 and BRC-RS1 expressed concern about long-term data storage, preserving data (BRC-RS8). BRC-RS10 said that their theme members handle large datasets, which was also important for BRC-SR4, who said that “manipulating basic data, something like Excel, is a big area”.

Also flagged were:

Individual research to keep up to date with developments in specific fields was a need cited by four of our interviewees to understand the meaning of a term (BRC-R13), or to broaden knowledge (BRC-R3), especially if it is to inform a “slightly new” field (BRC-SR5).

Information needs arising from working in a research network, which involves data collection and analysis, and the role of the Personal Assistant. For example, BRC-RS11 said that their role is to manage a Theme Lead’s diary and schedule: “ensuring they all run and interlink, the BRC... and the academic and the clinical of course”. There were references to increasing collaboration with multidisciplinary researchers, “partnering” (BRC-RS4), or finding other Oxford-based scientists to collaborate with (BRC-SR7).

Coordinating and managing research network activities, coordinating between different labs and clinics, was a theme discussed by research support staff. These activities included managing budgets and reports, grants, and coordinating between different labs and clinics (BRC-RS10) or having responsibility for the day-to-day running of labs (BRC-RS7).

Collaborating and working with colleagues from other BRC Themes or locations - mentioned by six of the interviewees. One Senior Researcher talked about coordinating and managing the Theme's research activities by interacting with other cross-cutting themes in the BRC3, collaborating with other Theme Leads who share research interests (BRC-SR5). This reflects a comment made by BRC-RS4 about the importance of networking and collaborating ("we do need to be partnering with them and working better").

Translational research was a theme touched on in relation to developing algorithms to track diseases (BRC-R3) and developing innovative ways to link data to allow scientists to more easily test hypotheses, test drugs, and test new technologies (BRC-RS2, BRC-RS8, BRC-SR1).

Open access publishing and repository related work was a theme mentioned in relation to the need to understand license agreements, copyright, acknowledgement requirements and terminology (BRC-RS1). As one research support staff member commented, "I don't speak publisher speak" (BRC-RS8).

Statistical and computer applications was a theme that came up in several interviews, and one focus group. Staff talked about needing special software to help with data analysis (BRC-SR4, BRC-RS6, BRC-RS8), or for statistical analysis (BRC-RS9). The staff at the third focus group requested licences from the library service to access software for this purpose (BRC-SR7 and BRC-R16). BRC-R3 needed information about coding.

Finally, one researcher needed information about using social media tools, as they had been tasked with preparing a social media plan for their project (BRC-R1).

8.2.1 Finding support and training

Participants were asked how they or others in their team had acquired the skills they need in their work. The question prompted them to talk about acquisition of information management skills and data management skills. They identified a variety of ways in which they find support to meet their work needs: self-tuition; the Bodleian Libraries; other libraries; other training suppliers; colleagues; the internet and e-resources; other sources; professional publications or books; email alerts; meetings and conferences; and one person stated that they put off finding support.

Self-tuition was flagged by many BRC staff members who said that they had acquired the following skills by themselves: using Endnote and other reference management programmes (BRC-SR4, R2, R8, R9, R12, R14, attendees at the third focus group); literature searching (using PubMed – BRC-SR5, R8, R12, and the attendees at the third focus group; using PubMed and Web of Knowledge (BRC-R9)); managing data (BRC-SR3; the participants of the third focus group taught themselves using Google); finding resources (BRC-SR5); using Symplectic (BRC-RS8); or using social media tools (BRC-R1). Being self-taught was therefore a strong theme in our data. Extending on from this, one Senior Researcher said that they "give training" themselves on subjects such as data management (BRC-SR5).

The Bodleian Libraries were flagged as a source of support by several BRC staff members whom we interviewed - referring to going to the library, using the Bodleian or Bodleian Health Care Libraries' services, to acquire skills to meet information or training needs. One Senior Researcher talked enthusiastically about the library service at Oxford, saying that he has worked at universities all over Europe, and Oxford is the best (BRC-SR2). Another researcher talked about coming to the library to get support with a literature search, saying that the librarian who helped them "was great", "We know she's brilliant.. We just both know you're fantastic" (BRC-R1).

The researchers said that they access most of the resources that they need online (via Bodleian Libraries subscriptions) (BRC-SR7). As a Senior Researcher said, “Because I can access everything through my internet connection now, and being lucky and in being a part of this fantastic University and having access. Why would I go to a library? Well, I know why, it’s a quiet place to work” (BRC-SR4).

Other training suppliers were also mentioned. Five other sources of training were identified in the interview data: other libraries, University courses; Oxford University IT Services; Medical Sciences Division Training Courses; and NHS or Hospital training courses.

A few BRC staff members mentioned acquiring skills about the reference management programme Endnote at sessions held by the University of Oxford’s IT Services (BRC-R7, RS5, RS8, RS11, RS12), or about the statistics programme SPSS (BRC-SR3 and SR4), for training about Excel or databases (BRC-RS6). Otherwise, one researcher talked about using the Lynda.com website, and going to IT Services for sessions on coding, using the computer systems, and graphics (BRC-R3).

A few researcher staff members said that they had attended MSD training courses to acquire skills about Writing Papers (BRC-R2), statistics (BRC-R11), and one interviewee said that they had attended “the one week microscopy workshop. I really enjoyed it” (BRC-RS5).

Colleagues were mentioned by several interviewees mentioned as sources of support. One researcher has built up a list of contacts within the University and at the hospitals who they contact for help with a variety of tasks, such as in writing grants (BRC-R1), which is a strategy adopted by another interviewee (BRC-RS8). They also said that they were currently relying on a PA to help them to use the systematic review management software Covidence (BRC-R1). Members of research support staff said that they would ask someone else who has the experience in answering a certain statistical question (BRC-RS9), to check a diagnosis (BRC-RS6), or to tell them about an unfamiliar subject (BRC-RS4). A Senior Researcher told us, similarly, that their strategy for starting to search about a new and unfamiliar topic would be to ask “somebody who knows a bit more about the field...for a recommendation of the single paper” (BRC-SR5).

Some of the interviewees mentioned relying on Google for support with their information needs, to find answers to questions about a definition of a concept (BRC-R13), coding (BRC-R3), resources (BRC-RS8), PPI (BRC-RS4), a diagnosis (BRC-RS6), genetics (BRC-SR7, R16). Some referred to using a combination of online tools, such as Google Scholar and PubMed (“...personally I prefer Google Scholar because I think the search engine is generally a lot better than PubMed” – BRC-RS5), a sentiment shared by another researcher (BRC-R2).

Several other sources were mentioned by our interviewees in relation to the acquisition of data management skills, or they were unspecific about where they had acquired some other skills. One staff member said that they had done an Open University module about data management (BRC-RS1), and one researcher had received RDM training through “the London School of Hygiene and Tropical Medicine’s MSc in clinical trials. And that’s a whole module, one of eight, is about data management and databases” (BRC-SR4). Good Clinical Practice training was mentioned by a few interviewees in response to our question about data management training, “...which has some on keeping data secure, using unreliable data and things” (BRC-R10), or which was described as “a database course” (BRC-RS6). Similarly, a member of research support staff said that they had received training in analysing data, where it should be stored, and storing it so that someone else can use it (accessibility), and was unspecific as to where they had this training (BRC-RS9).

Three BRC staff members talked about referring to nursing publications for answers (BRC-R13), or to books (BRC-R9, RS9). One senior Researcher referred to “email alerts” from “the New England Journal” as a source of support for current awareness needs, and they asked the interviewee if “there [are] other email alerts that you send out?” (BRC-SR1). This same Senior Researcher also said that they receive support for their current awareness needs from their departmental meetings (“Sometimes”), or “sometimes going to conferences” (BRC-SR1).

Finally, one researcher frankly stated that they do not find support for their information needs. They were open about carrying on “dinosaur-like” with old methods because there is so much to be doing, you put off things that will take time to learn and are “lazy” (BRC-R12).

From this data, we can see that literature searching was the dominant theme in terms of the information needs discussed by interviewees. We found, as would be expected, that the different staff roles have different information, skills, and training needs.

The Research Support staff reported most often that skills they need are around managing personal information, reference management and use of Symplectic. The second and third most frequently mentioned themes coded for this group were literature searching, research data management (RDM) and governance/stewardship.

For Researchers, the most significant information needs (in terms of frequency of reference and emphasis in interviews) were jointly literature searching (as an individual responsibility), as well as personal information and reference management. RDM was a third major need coded from the responses.

For Senior Researchers, the most frequently cited information need was RDM, followed by: grant writing and proposal preparation; publishing and presentations; coordinating and managing research network activities; and literature searching (both as an individual responsibility and for systematic reviewing).

The majority of the staff reported that they had taught themselves skills such as how to use reference management software, literature searching, data management, how to use social media tools, or how to use Symplectic Elements to deposit items in Oxford’s institutional repository. Breaking down the results about skills and training by staff group, we see that Research Support staff are more likely to approach IT Services, a colleague or manager, or use their knowledge from other libraries in order to meet an information need. Researchers are most likely to be self-taught, or use the Bodleian Libraries or the ‘University’ for skills and training. Senior Researchers, in turn, are most likely to be self-taught, or to have had training from the Bodleian Libraries, or IT Services.

8.2.2 Barriers to accessing information or support

KEY MESSAGES

BRC staff from all categories reported several barriers to accessing information or support.

The most frequently flagged issues in our interviews were: access to papers or books; lack of awareness about the services provided by the libraries; and the time and effort required to find information or to learn about library services or resources.

Other issues flagged were access to tools and resources; unfamiliar tasks or subjects; lack of skills; university website, IT access, or technical problems; information which is not easily available; a lack of clarity around roles; library hours; and other issues to do with BRC rules around acknowledgements or data, Symplectic Elements, information overload, not being able to access University training, and not wanting to waste library staff time.

These, or very similar issues, are also reflected in the literature.

The solutions drawn from the literature and from interviewees involve library workshops, online tutorials for those who cannot come to the library during working hours, and promoting clear messages about who to contact for help.

Our interview data revealed the barriers which prevented or hindered BRC staff's access to information or support: access to papers or books; lack of awareness; the time and effort required; access to tools and resources; unfamiliar tasks or subjects; lack of skills; university website, IT access, or technical problems; information which is not easily available; a lack of clarity around roles; library hours; and other issues to do with BRC rules around acknowledgements or data, Symplectic Elements, information overload, not being able to access University training, and not wanting to waste library staff time.

Issues with lack of access to papers or books is a topic which arose frequently in the interviews (13 interviewees). In particular two of the Senior Researchers that we interviewed had extensive comments to make about difficulties in accessing papers. BRC-SR4 said that there are a few journals that they and their team could not access, "there are times when that becomes a stumbling block", and even for papers in journals that the library does subscribe to for the University, they described the "twelve steps" that they had to go through to download each paper required for research. BRC-SR6 agreed to an interview specifically to talk about the lack of journal access for NHS staff employed to work on BRC projects which the NHS is funding. This is a major problem for their research team, their "biggest bugbear".

Our interviewees talked about lack of awareness about library services, resources, and about skills that they were missing or lacking. In the context of library services, one member of the first focus group told us that they had just published a review paper for which they had searched for the literature themselves because they did not know about the library service, or what we can help with (BRC-R4). A Senior Researcher said that "scientists" in particular "don't know that they can, B) they don't know what you can offer, C) they don't know whether they're asking a really stupid question or you're the wrong people to ask" (BRC-SR3). One researcher said that "the librarians are not well

advertised” (BRC-R3), and a staff member said “..I’m not sure that it’s widely understood that, you know, by working with.. .one of the specialist subject librarians.. that they could actually save themselves a lot of time and effort” (BRC-RS3).

Linked to awareness, a lack of clarity around roles was also flagged by three interviewees. “I don’t understand where the library ends and IT starts”, as one Senior Researcher said (BRC-SR5). Another Senior Researcher said that: “I don’t know how wide your remit is in the information centre, whether it would extend for example to enabling people to digest information better and the sort of front end of the presentation of our data to the public and stuff like that as well. I don’t know how far it goes.” (BRC-SR4).

Time and effort required was another popular barrier to information access, with one research support staff member explaining that they get frustrated with not knowing how to use certain databases and export the search results into a reference package, “Stupid things that won’t take long if someone shows you” (BRC-RS2). Finding the time to search the literature was a subject mentioned by a Senior Researcher (BRC-SR4), researchers (BRC-R9, R13), and research support staff (BRC-RS4), or having time to organise an Endnote library (BRC-SR5).

Other barriers to information and services that our interviewees talked about include the following:

- Unfamiliar Tasks or Subjects. As mentioned above, we met one researcher who talked about working on a new task as being “irksome” (BRC-R1), the Senior Researcher who is writing a paper on a subject which is new to them (BRC-SR5), the research support staff member who is writing papers for the first time (BRC-RS7), and a fourth staff member who was also finding out about new subjects (BRC-RS4), all of which are examples of BRC staff who hit a barrier when working on unfamiliar tasks or subjects.
- The lack of skills for certain tasks, as reflected on by a researcher who does not know how to be specific enough with her literature searches to find the specific papers she needs (BRC-R12), a research support staff member who is writing papers for the first time and realised that her search skills are also not adequate (BRC-RS7).
- University Website, IT Access, and other Technical Problems
- Access to Tools and Resources were mentioned by two respondents. One research support staff member mentioned how it would be good to have “better tools to scribble on PDFs, not Adobe” (BRC-RS2), for example, or needing bespoke online databases (BRC-RS8).
- Information which was not easily or readily accessible or available to them: one has trouble finding papers with specific methods within papers (BRC-R12); the other said that they had scenarios when “the information wasn’t there” (BRC-RS3).
- The subject of library hours and opening times was a barrier mentioned by one staff member (BRC-SR2).
- The need for new rules about acknowledging the BRC in publications to be better promoted, with official documentation (BRC-R8).
- As mentioned elsewhere, staff mentioned checking publications for acknowledgements of BRC funding as a barrier, one asking if this is a task that can be done centrally, or if there was a BRC button on Symplectic (BRC-RS1, R8).
- The need for the BRC to issue rules around data management (BRC-R8).
- Needing somewhere for researchers to archive their data, as the ORADATA service “isn’t so well developed” (BRC-RS1).
- Information overload was a barrier mentioned by several interviewees (BRC-RS1, RS3, R10).
- The lack of access for BRC-funded NHS staff to University training courses (BRC-RS8).
- Not wanting to waste library staff time was a barrier to receiving skills training, mentioned by one research support staff member (BRC-RS4).

These are familiar barriers and challenges from the literature.

Smith et al (59) include lack of awareness about library services, “Patron preference for interacting with a person” (which means that one of their nine interviewees said that they wanted “a point of contact to call for specific information”), “Barriers to sharing information”, and “general challenges related to the complex university environment” (such as “Knowing what is available, where to go to see what is available”) in the findings from their information needs assessment of the North Campus Research Complex residents who conduct translational research at the University of Michigan.

Haines et al also found that their basic science researchers had a lack of awareness about library services (57). A lack of clarity about roles were challenges expressed by the LIS staff in the UK and Europe interviewed for this project, and this is a barrier that authors such as Holmes et al also encountered in their study about library-based clinical and translational research support (31) as well as Vaughan et al (63).

Pitocco (54) also asserts her finding that clinical laboratory scientists encountered time, financial, and technology-related barriers, such as “poorly designed computer systems”, as well as “inadequate training”. This last barrier suggests a need for library-facilitated workshops or training. Vibert et al (61) similarly found that neuroscience researchers and PhD students in laboratories had difficulties searching PubMed effectively, for example, because of a lack of training. Researchers were too busy to take the time to organise or attend training to meet this need, and so the authors suggest online tutorials as a solution.

Lack of time to conduct research or find papers for presentation or publication was a barrier cited by De Rosa et al (62) in their findings from information needs assessment interviews with physicians and fellows at a Breast Imaging Service. Likewise, Roos found in her 2015 study of medical scientists’ information practices that they lacked time, “access to information resources” (including either the most recent or older materials), and that they lacked adequate search skills (56). Lacking time and adequate search skills was a finding by Wessel et al in their 2006 study of Clinical Research Coordinators as well (60). These were barriers for doctors and nurses reviewed by Younger, along with a lack of awareness about services (58), a recurring theme in the literature.

Information overload was a challenge or barrier identified from research by Bhavnani et al about the needs of Clinical and Translational Science researchers from the University of Michigan (40).

Solutions to some of these barriers are suggested by several authors: to meet the need for training about specific skills, Pitocco (2014) (54) suggests library-facilitated workshops. BHCL needs to promote clear messages about who to contact for help with specific needs would resolve the lack of awareness about services (57, 59), as well as providing clarity about roles (see section 3.5 about Promotion and Awareness).

8.3 Embedded Informationist Services

KEY MESSAGES

We are interested in embedded library services in the research context as, “If we are truly to be where the user is and to be user-centric, we need to be embedded” (65).

Informationists are “in-context information specialist[s]” (71).

A wide variety of research support services were mentioned by interviewees, and confirmed in the literature, covering most aspects of the research lifecycle.

There are many examples in the literature of successful informationist programmes and the benefits on the research groups with whom they work.

Articulated benefits of embedded or informationist services for researchers include reduced waste in biomedical research (by undertaking and supporting comprehensive and rigorous literature searches), improvements to researchers’ own search and data handling skills, improved grant applications, time saving and workload reduction.

Examples of support provided from the interviewees (and confirmed in the literature) include information literacy skills training and literature searching services. Other activity includes support for research data management, other kinds of training sessions, promotional activities, bibliometrics and reference and personal information management support.

Our interviewees reported that informationists need to work closely with researchers to assess needs, develop appropriate tools and services, and should therefore be embedded with research teams. The literature supports this.

Successful services are defined by various measures including their volumes of activity, by co-author credits on papers, and by the fact of their continued funding.

Success is also measured through qualitative and quantitative surveys, interviews and focus groups.

Interviewees reported numerous challenges to running successful services, including prioritising activities, identifying user needs, and ongoing promotion.

8.3.1 The development and benefits of embedded information specialist and informationist services: the literature

BHCL is interested in embedded library services in the research context as this concept has been a major driver for change in library services (64, 65) since it first appeared in 2005 (66), and was expanded on in a review by Shumaker and Tyler in 2007 (67).

It is pertinent because “If we are truly to be where the user is and to be user-centric, we need to be embedded”, as Kesselman argues (2009) (65). As Robinson-Garcia and Torres-Salinas outline in a 2011 paper, “the embedded librarian’s aim is to become involved in a research group to the extent of becoming an irreplaceable member of it with inside knowledge of all its activities”. They summarise

the “three main pillars” of the work of embedded librarians as “managing data, monitoring the research group’s visibility, and mediating in the communication process with journals” (68), with involvement in every stage of the research lifecycle.

A 2012 review of the literature about “embedded librarianship” reveals that this term is understood in different ways, and common activities include being embedded in a course management system, co-teaching courses, or providing in-depth research support for students or researchers. Through analysing evaluation methods, the author concludes that “Surveys suggest that both students and faculty appreciate embedded library services” (69). Most recently, Kirtley argued in the *Lancet* that by embedding librarians “within every biomedical research department, or at least within every research team”, the current waste in biomedical research can be reduced. Embedded librarians can conduct comprehensive and rigorous literature searches, and assist with “preparations for funding applications” by assessing “the extent of uncertainty and identify relevant ongoing research”, for instance, and peer review literature searches in publications for biomedical journals or funding applications to “contribute to more meticulous funding decisions and to the publication of better research”(70).

Wu and Mi propose a five-level model of embedded librarianship in health sciences libraries, describing the different roles, knowledge, and skills which are desirable for embedded librarians. They provide examples of strategies and steps in their model that can be taken to achieve the highest level of embeddedness, by developing a physical and cultural presence in order to integrate into research units or departments, building close relationships with staff, and collaborating with staff and students to develop print and online collections to meet information needs. The librarian’s role develops from Level 1 as a “service provider”, to having “faculty status in an academic department or college” at Level 5. The authors argue that their model can be used to improve the quality of library services, and to enhance the value of librarians, promote professional growth, recruit new hires or achieve librarian vitality, helping them “to remain relevant to the mission and goals of their home institution” (25).

Informationists are “in-context information specialist[s]” (71). The role was first described in an editorial in the *Annals of Internal Medicine* in 2000 by Davidoff and Florance, with the aim of introducing a staff member in order to bring evidence into clinical practice (72). Grefsheim *et al.* (2010) report that “(T)he National Institutes of Health (NIH) Library hired its first two informationists – librarians with extensive expertise in a clinical or research specialty – in 2001 and assigned them to research teams in their fields of expertise”, with the programme growing over the following years. In 2010, the library had “fifteen informationists who are members of more than forty NIH clinical and / or basic science research teams” (73). One informationist, Gore, describes the people holding these roles as “a librarian with a disciplinary background in biomedical, behavioural, or biological sciences, as well as library and information science, who serves the research team by offering expertise in the areas of data and information management”. Informationists therefore usually work as members of research teams for defined periods of time (Gore worked for 18 months on one grant (71), with a defined role.

There are many papers about the benefits of informationist programmes. These help us to define what successful informationist programmes look like, and how their success is measured and evaluated.

Grefsheim *et al.* conducted a study about the effects of informationists on the information behaviours of NIH clinical research teams, using focus groups, interviews, and baseline and follow-up surveys to evaluate the informationist service. Respondents were “highly positive” in their answers to questions about whether they would work again with informationists, and if “they would recommend an informationist to others”. For example, 80% reported in 2004 that “they would use the service again”, which increased to 100% in 2006. The authors report that the findings from their study are “suggestive

of a positive effect over time from having an informationist as a team member”, as “survey respondents reported they were significantly more likely to pursue answers to questions and they were more satisfied with their ability to find needed information” a few years into the programme, by 2006. Furthermore, “Informationists also appear to have had a positive effect on the range of information services and resources consulted by PIs or co-PIs and fellows in response to an information need”, as between 2004 to 2006, “the range and frequency with which other databases [not just PubMed] were consulted by PIs or co-PIs and fellows rose considerably”. As the databases and classroom training about their use “had been available to NIH staff for several years prior to the first survey”, this could only be due to the informationists at the NIH library. The investigators they interviewed and surveyed “thought their informationist added needed expertise, found information that they otherwise would not have found, added thoroughness, saved them time, and reduced their workload burden”. The authors conclude that the informationists had a positive effect on the scientists’ information behaviours, with their information science expertise “most highly valued” (73).

There are many other examples of successful informationist programmes, and the benefits on the research groups with whom they work, from the literature. Federer’s 2016 paper about providing data literacy training to meet RDM needs of researchers concludes that “targeted training” by the informationist ensures that researchers are successfully able to “produce datasets that are well managed, clear, understandable, and shareable with the scientific community”, meeting funder requirements for data management (21). DeRosa *et al.* discuss the findings of their 2016 paper, from questionnaires and interviews, to determine the information needs of staff in a breast imaging service, that informationists can meet those needs and benefit the work of the staff members in many ways, including searching for the evidence and “current awareness alerts” to meet research needs and “ongoing learning”. They can provide “general consultation and training services, both on an individual and group level”, save clinicians and researchers’ “time and effort” with “just-in-time resource training”, such as reference management software training, helping busy staff members to organise their references (62).

In terms of assisting with systematic reviews, Brander and Pawliuk (2017) demonstrated that by embedding two health librarians onto a clinical research team, the quality and efficiency of a scoping review project was improved. They argue that this is because librarians can offer the right skills to solve problems with large data sets, resolve “broad research questions”, and work with “geographically dispersed team members”, along with their knowledge of software and systematic review tools that can improve the workflow efficiency of these projects (74).

Brahmi and Kaplan’s 2017 paper about embedding a librarian in “an upper extremity surgical and therapy practice” team provides detail about the benefits of these information and library services from a perspective outside the library. These clinicians argue that the benefits of a “research-embedded health librarian” include bringing “awareness” of new education methods “such as the flipped classroom”, and can “provide faculty instructional support”. The librarian can also “[I]ncrease awareness and access to in-house and electronic resources and help transition from print collections to online access and resources”, and “[I]dentify grant opportunities and assist in the writing of grants”, all of which can “result in cost and time savings for the surgery and therapy staff”, and “enhance research expertise and perspective to existing...staff” (75).

We can include Glenn and Rolland’s findings about successful services from their 2010 study about emerging roles for information professionals in biomedical research teams as follows:

“Participants consistently defined success as positive recognition of their work by clients. When they knew that a client was satisfied, they felt sure they had done a good job. One participant mentioned she felt she was doing a good job if she was busy and people continued

to seek her help. Co-authorship was also mentioned as a sign of successful service to research groups.” (12)

Alternatively, for Freiburger and Kramer, the success of the embedded, or liaison, library services provided at the college of pharmacy at the University of Arizona, Texas, is defined by the fact that the “librarian is so busy that a second librarian now spends several hours a day in the library filling requests for literature searches and general research” (76). These authors measure success through the numbers of enquiries and literature search requests that the librarians receive from department members

The other metric of success, as Holmes *et al.* (31) point out in their paper about library support for clinical and translational research, is “financial support, through paid effort on the CTSA [Clinical and Translational Science Awards], commitment of funds for shared resources, and / or funds for library personnel to travel to conferences and training” (31). The number of informationist programmes now supported at universities and institutions in the US supports this point, such as the Johns Hopkins Medical Institutions in Baltimore, Maryland (there are 13 informationists at the Welch Medical Library (77)), the University of Michigan (there are 19 informationists for the University of Michigan’s health sciences community (78)), and the National Institutes of Health (which currently has 15 informationists (79)).

8.3.2 The interviews, emails and focus groups with LIS staff and US informationists

For our interview, email and online focus group data, we contacted research informationists and other specialist services provided by librarians embedded within the research team (rather than working from a library base).

Funding arrangements and perceived reason for existing embedded service

The results of the data gathered from 11 LIS staff and four US Informationists shows that embedding librarians in research teams depends on funding and the development of the role, typically from service provider to service innovator (25). The three broad themes from the data revealed three main reasons for services to be set up: 1) systematic review support, specialised literature searching, or support around bibliometrics; 2) research data management; 3) various research group support services.

Five of the nine respondents from the UK are information specialists embedded within University departments, funded at least partially by research projects, and are not part of the university library service (LIS2, LIS3, LIS7, LIS8, and LIS11). Four of the five were well-established services, one of which had been operating for ten years with four information specialists in the team (LIS7). She built up her user base and the number of projects she was funded to work on, and the team has expanded as demand has increased. Over the years, LIS7’s information specialist team have branched out to work with other researchers in their University.

Two European LIS, both information specialists, responded by email to our questions. LIS9 was setting up a service to be launched in 2017 “to offer support for systematic searches to medical students, clinicians and researchers”. LIS10 has been in post for 13 years as a solo information specialist in an academic hospital, providing literature search and enquiry support.

The four North American informationists (anonymised as NA-I 1-4) who responded to our emails are mostly embedded in research groups and work in established informationist services which were set up ten or more years ago. Most of them do not work in the library, and are instead based in offices

within university departments. For example, NA-I3 is the manager of a service with 11 informationists who “provide education and search services using an embedded service delivery model, providing tailored information services wherever our users are”.

From the literature about informationist services, there are many reasons provided to explain why they were set up and descriptions of how this was done, similarly explained in terms of the need for the activities provided. For example, a special issue of the *Journal of eScience Librarianship* in 2013 included several case studies of informationists or embedded librarians and their role in the scientific research process (e.g. (71) and (99)).

Gore (71) describes, for example, an 18-month period as a member of a research team on a grant, “Promoting Breast Cancer Screening in Non-Adherent Women”, working as an informationist at the Lamer Soutter Library, University of Massachusetts Medical School. They won a grant from the National Library of Medicine to fund the informationist, one of whose aims was “to improve the communication about data between members of the research team”, making sure they consistently use a precise language for data analysis from a data dictionary developed by Gore. Her other aims were to search for literature on a particular information technology issue, identifying where the team should publish a paper about this, leading on a systematic review, improving the team’s searching skills, as well as assessing the value of the informationist to the team.

It is clear from our data and interpretation about what our respondents do and how they are embedded that generally this looks like working in a department as a funded member of the team to provide information services separate to those provided from the main institutional library. Our respondents all explained why they set up their services in terms of the need for the activities that they have developed and now offer.

Services provided by UK/EU information specialists and North American informationists

As we have started to demonstrate in this section, there are a variety of services provided by library and information services in the UK, Europe, US, and elsewhere in the world to health or biomedical researchers, clinicians, and University students. From the data provided by the LIS professionals in the UK and Europe in response to the question “What services do you provide? What is the workflow and activities – what they do, what don’t they do?”, the majority of them reported that their services include two activities: information literacy skills training; and literature searching services. RDM, other kinds of training sessions, promotional activities, and bibliometrics are four other services provided to lesser extents by these professionals.

Information literacy skills training. LIS2 said that she works with researchers and students, providing one-off consultations or group training sessions. She gave the example of a workshop for PhD students which was organised initially without a clear topic at which they ended up discussing the differences between systematic and scoping reviews. LIS3 said that she also meets postgraduate students for a 1-1 to show them “how to find papers” for dissertations, and she’ll be put on the curriculum next year for the Masters courses to provide this training formally. LIS10 wrote that she teaches “the basis of the bibliographic search to the personnel of my hospital”.

Information literacy skills training is referred to in the general librarianship literature, such as in Schulte’s 2012 review (69), or Exner’s 2014 paper about researchers’ information literacy needs (43), and Kesselman in 2009 (65); the embedded librarian literature (Hoffman (88)); and in the medical or health sciences librarianship literature (Cheek, 2010 (90); Glenn, 2010 (12)).

Literature searching services. The information specialists who are funded by and based in university departments all reported that they assist with systematic reviews. LIS2 provides support to PenCLAHRC-funded researchers, working with them throughout the project lifecycle from the initial research question, doing the background scoping searches for the funding bid, helping with the iterative process of searching and setting up screening programmes for systematic reviews. LIS8 works on evidence synthesis and systematic reviews. LIS7 provides specialist searching services for health economists at a University and for NHS staff and academic researchers with dual NHS/University contracts. Like LIS2, she reported that a major part of the work of her team is getting research grants in the first place, helping with the searches for research proposals.

This activity is referred to in the relevant medical librarian literature, such as in Kirtley's 2016 call to end waste in research through research teams employing librarians to conduct literature searches for various purposes (systematic reviews, funding proposals) (70), or in Schulte's 2012 review of the embedded librarian literature (69). (See also Cheek, 2010 (90); Geng, 2015 (98); Glenn, 2010 (12)). Literature searching services are also described in the informationist literature (Gore, 2013 (71); Grefsheim, 2010 (73); Henderson, 2016 (81); Holmes, 2013 (31); Smith, 2014 (59); Surkis, 2013 (84)) and embedded librarian literature (Freiburger, 2009 (76); Greyson, 2013 (64); Janke, 2014 (82)).

A third activity is around research data management (RDM). LIS6 manages a small team who provide research data services for a University. They handle data management and storage requests, hold 1-1 consultancies with users who need data management plans, and she holds training sessions for librarians, researchers and students about research data management and data policies. All eleven informants were questioned about their support services for RDM. Two respondents are based in the same University, and both of them reported that their institution provides "generic training based on the biosciences", with sessions delivered to first year PhD and Masters students which cover RDM (managing data, version control, metadata, making sure data is shareable, why and how to share data, data management plans) (LIS1 and LIS4). LIS4 provides RDM support to research groups. One of the information specialists said that there was another member of the research support team she belonged to who was responsible for RDM (LIS3), or that it was the responsibility of the University library to provide advice and services (LIS7). The general feeling is that "Researchers are a law unto themselves with data management" (LIS5) and that more training is required for Library and Information staff. LIS9 was focussing on developing their support for systematic reviews, but wrote that "perhaps in the future we can also build a service for research data management".

There is now a wealth of literature about RDM activities of libraries, librarians, informationists (Bardyn, 2012 (38); Corral, 2013 (91); Cox, 2017 (80); Creamer (18), 2014; Diekema, 2014 (102); Federer 2013 and 2016 (21 and 83); Gore, 2013 (71); Hanson, 2013 (103); Hasman, 2013 (104); Henderson, 2015 and 2016 (81 and 105); Hswe, 2012 (106); Johnson 2012 and 2016 (87 and 107); Kim, 2016 (108); Lyon, 2016 (50); Medina-Smith, 2016 (109); Peters and Dryden, 2011 (110); Pinfield, 2014 (111); Shaffer, 2013 (112); Surkis, 2013 (84); Tenopir, 2014 and Tenopir, 2017 (19 and 113)).

Most of the literature has come from North America, although some institutions in the UK have active RDM programmes (e.g. 114 and 80). Allchin et al, for example, describe the JISC-funded RDMRose project, which led to the development of an Open Educational Resource on RDM for information professionals, especially for liaison librarians who are typically embedded within University departments to some degree (114).

Our LIS interviewees also deliver other kinds of training sessions, not just information literacy sessions: LIS8 described teaching sessions that she and her colleagues (in a group of 3 FTE information specialists at a university) provide on Making Sense of Evidence, at which they cover Evidence Based Medicine, how to critically appraise a paper, statistics. LIS7 is one of a team of four information

specialists at a university who manage “short research methods training classes for researchers” (from an email). For researchers, LIS2 holds consultations with people on Endnote, setting up smartgroups, technical issues. All of the LIS professionals were asked about reference management support services. LIS1 also mentioned providing reference management software support for first year PhD and Masters students, LIS7 provides reference management advice for people working on systematic reviews and reference management software training for postgraduates (such as Endnote; their IT services failed to install Mendeley on their training computers), LIS9 wrote that they “are hoping to cover relevant topics, such as reference management software, through on-line tutorials”.

Similarly, Freiburger and Kramer (2009) (76) describe the “drop-in sessions” held by liaison librarians at the Arizona Health Sciences Library “for students in the college computer classrooms, instead of library-based classes on database searching and information resources”, and Hoffman (2011) (88) describes a mixed-methods study to explore the experiences of librarians who are ‘embedded’ in online courses at libraries based in the USA, such as providing services to distance learners with “customized library instruction” courses. Smith et al (59) describe the training provided by the translational research librarian at the North Campus Research Complex of the University of Michigan, who “provides training on information and data-management tools, including Access or citation management products”, and “ consultations and lab-specific workshops”.

Providing support for bibliometrics, as in the case of LIS1 and NA-I3 is an activity mentioned by several authors in the literature, such as Corral et al’s 2013 study about “emerging trends in library services” across 140 libraries in Australia, New Zealand, Ireland, and the UK, which found that the “most common service offered is bibliometrics training or literacy, followed by citation reports and calculation of research impact” (91). (See also Grefsheim, 2010 (73), and Hendrix, 2010 (93).

Promotion of services was covered by question 12 for the UK and European LIS professionals was “How do you promote your service?” This is evidently a significant activity from reviewing both our data and the literature and is reported in one of the following sections of this document.

We have identified several challenges in the data from our UK and European LIS professionals and the North American Informationists in relation to setting up or running embedded services: identifying and meeting user needs; evaluating services; communicating with users in clear language and promoting services; prioritising activities; funding; figuring out the scope of a role; the skills required to embed a librarian in a research team; and space.

Identifying and meeting user needs. The UK and European LIS professionals were all asked question 4: “How do you identify your researchers’ needs?” In response to this, the informationist service manager (NA-I3) said that one challenge is “Keeping tabs on researchers information and training needs is an ongoing process.” She wrote that informationists’ relationships with staff specific departments mean that they will “understand users’ workflows and processes”, therefore be able to “recommend services, resources and tools that are responsive to their needs”, relying on “flexibility.. [to] adapt easily to what works best for them”. Talking to them, whether informally (LIS7) or with a formal reference interview (LIS10), is the common thread of the responses to question 4. LIS1 mentioned that finding out users’ needs is “tricky” because people are not sure about their needs. They suggested that the solution is to ask researchers about their work and what they “get stuck” on as the best way to find out their needs.

How to evaluate services, both to find out users’ information and service needs, and to find out how well the LIS professionals are meeting those needs, a challenge Whipple et al address in their paper about informationists at the Indiana University School of Medicine (118). There are examples of best

practice in the literature about how to do this (e.g. Schulte, 2012 (69); Whitmore, 2008 (119)), and ideas about how to start assessing “library-based translational support services” (Holmes, 2013 (31)).

The UK and European LIS professionals were asked question 10, “How do you monitor, report and measure impact and effectiveness?” LIS2 reported that she measures her impact around descriptive statistics she gives to her manager. She reports on the projects that she is funded to work on, the number of consults, and other professional activities. She keeps a record of the different projects, different people and the relationships that she builds because she is considering how she will be judged, both in terms of the number of projects she is funded to work on and the research that she does. LIS4 said that her manager does not ask for any reports, and so she keeps reports for herself, wanting to the reporting back process to her manager and to the departments she works with, with statistics and feedback on training sessions.

The question of “How do you prioritise your activities and support?” to our library and information professionals in the UK and Europe raised the difficulty experienced sometimes in prioritising activities. As NA-I3 summarised, “Much of prioritization depends on funding (if applicable), work load, estimated time to complete work on a request, and agreed-upon or negotiated deadlines of projects.”

LIS8 said that it’s “tricky for everyone” to prioritise workloads and activities, often on a daily basis, for example when asked to update a systematic review that they worked on five years ago, which still had not been published. LIS11 wrote that some activities were prioritised if they had a short deadline, and that “Students were only if time permitted but rarely would we turn someone away”. Problems to do with workload and capacity were also alluded to by LIS11: “Being the only one was sometimes hard because there are definitely peaks where there's a lot to do.”

This subject is addressed by Whipple et al (118) in their case study, as the three informationists involved with one project had to balance their time between the project and their “prior and ongoing job expectations”. They do not offer any easy solutions. Hendrix also addresses the issue of introducing a new service, bibliometric services at the University at Buffalo’s Health Sciences Library, only to find that rigorous bibliometric searches are “time-intensive”. “Finding the time and staffing to perform highly detailed citation analyses has proven to be difficult”, and so they decided to provide this service on an on-demand basis (93).

Challenges surrounding the issue of funding were flagged by three of the more embedded LIS professionals which is also picked up in the literature. For example, Dennett found that research-embedded health librarians in Canada were more likely to be on temporary contracts, possibly because “grant funding cannot be guaranteed from year to year, some organizations may not be financially or contractually able to offer permanent work” (Dennett, 2013 (32)). LIS7 was the most descriptive about these problems, as although the University underwrites their funding, this professional regularly has to prove that the team is earning a research income from 40-50 projects. This is linked to the issue raised by LIS11 that “Unfortunately not all researchers would consult before funding for an info specialist so they would cost in maybe 2-3 days and think that would be sufficient to do all the work.” Allocating enough time and funding for the information specialist was also mentioned by LIS8, who said of the searching process that “People don’t realise how long it takes!”, and that the cost of the time it takes an expert to search the literature always surprises researchers. Managing expectations in this context is therefore an additional challenge.

Scope of role was flagged by LIS2 who mentioned that she had trouble when she began her post figuring out the scope of her role, and she said that she had learned to be clear about her role after an initial meeting with researchers, which had left them confused. At the second meeting, the researchers were more understanding that a little help from her can go a long way. This fits with the

findings of Whipple et al, who describe that one challenge their team had was to communicate the role that informationists can play in a project (118).

Understanding the scope of these roles and how they fit in with other library staff in an institution links to findings in the literature that embedded librarians “in an academic milieu should not be seen as competition for liaison librarians but rather as partners offering complementary services in support of the research mandate of the school, thereby freeing academic librarians” to perform other tasks to support staff and students (Dennett, 2013 (32)). The five LIS interviewees who work as information specialists for research departments were asked about their relationship to the library service in their Universities, and all of them agreed that they had good working relationships with the library staff, were not seen as encroaching on their territory or their roles, and offered complementary services (LIS2, LIS3, LIS7, LIS8, and LIS9).

Skills required to embed a librarian in a research team was raised by LIS1: how to embed a librarian who does not have a particular specialist background in a research group with that speciality? What upskilling would be needed? Is it a viable option? This is an issue which we will return to in a later section of this document when we discuss the skills and knowledge required of library staff to provide more embedded support.

Other challenges identified in the literature include a problem with staff retention in these roles, and the skills required “to step right into these roles”, which library staff with less experience may not have, and may not be able to develop in “solo librarian” roles in institutions, without colleagues who can provide training (Dennett, 2013 (32)).

8.3.3 How do BRC staff perceive services that could potentially be provided by an informationist?

KEY MESSAGES

Twelve potential services were identified from the literature and presented to interviewees on cards as services that could be provided to BRC staff by an informationist.

The BRC interviewees were mostly positive in their perceptions of *all twelve* of the activities or services that an informationist could provide to their teams.

The most frequently highlighted areas of support flagged were literature searching (16 mentions), RDM (12 mentions), and reviewing, editing, and co-authoring articles for publication (12 mentions). Other areas of support with significant multiple mentions (mentioned by more than seven interviewees) included bibliometrics, bioinformatics, copyright, grant writing, support for open access, reference management, and support for interdisciplinary research

Interviewees from four of the 12 themes were very vocal in their support of having an informationist or embedded information professional join their research teams.

Only one interviewee from one of the other eight themes was negative about the idea.

Some interviewees reported that they already had staff in their teams to perform some of the activities, particularly literature searching and interviewees were satisfied with the staff who were currently undertaking the specified “informationist” activities (especially the interviewees were who were already performing these services for their teams).

However, even in those cases, most of the interviewees saw a role for an information or library professional assisting their team with at least some of the twelve specific activities discussed.

Reservations expressed in some cases by some of the interviewees about the range of informationist activities that could or should be undertaken included: lack of knowledge; lack of awareness of recent changes (e.g. open access, copyright); perceptions that another part of the BRC was or should be responsible; amount of specialist domain knowledge required for the activity; perceptions that some of the activities are integral to being a successful researcher (e.g. literature searching).

From the literature, we identified a list of twelve potential services that could be provided to BRC staff (13, 31, 44, 63, 83, 119).

1. Bibliometrics (e.g. for research evaluation, impact factor calculations)
2. Bioinformatics resources (e.g. NCBI databases) and tools
3. Collaborative network co-ordination (e-science, virtual research environments)
4. Copyright policies
5. Grant writing
6. Literature searching (e.g. for systematic reviews)
7. Network/systems support for translational research
8. Open access publishing and deposit requirements
9. Reference management/personal information management support
10. Research data management (data organisation/description/stewardship of data collections/shared data and open data requirements)

11. Reviewing, editing and co-authoring articles for publication
12. Support of interdisciplinary research

BRC interviewees were mostly positive in their perceptions of all 12 of the activities or services that an informationist could provide to their teams and most of the interviewees saw a role for an information or library professional assisting their team with at least some of the 12 specific activities discussed.

The most frequently highlighted areas of support flagged were literature searching (16 mentions), RDM (12 mentions), and reviewing, editing, and co-authoring articles for publication (12 mentions). Other areas of support with significant multiple mentions (mentioned by more than seven interviewees) included bibliometrics, bioinformatics, copyright, grant writing, support for open access, reference management, and support for interdisciplinary research.

Broken down by staff category, the Research Support staff reported the most positive mentions for RDM, followed by literature searching, and then (jointly) copyright policies/open access/reference management and personal information management/reviewing...articles for publication. The Researchers were most positive about literature searching, followed by reviewing articles for publication, and grant writing. The Senior Researchers were most positive about RDM. Bibliometrics, grant writing, literature searching, network/systems support for translational research, open access, reference management and personal information management all received equal weight in terms of positive responses.

Section 8.2 supports these results, as it revealed literature searching to also be the interviewees' greatest information need, followed closely by RDM. The major difference between the expressed information needs of the interviewees, as described in section 8.2, and the interviewees' perceptions of the informationist activities as outlined below, is the relative lack of importance placed on personal information and reference management. The information and training needs that the BRC staff described in the interviews differ slightly to their perceptions of the informationist activities in other ways, as reviewing and grant writing were not information needs that came across as strongly in section 8.2 (especially for Researchers). This discrepancy could be because the BRC staff did not know what information staff could help with until they were presented with the Information Sheet (see Appendix 3) and the Consent Form (Appendix 6) at the start of the interviews and focus groups, which provided them with a description of informationists and what they can do. These findings from this section and section 8.2 provide evidence that the interviewees both need and are positive about support not just with literature searching and RDM, yet also support with all of the other informationist activities except for collaborative network collaboration.

Some interviewees reported that they currently had staff in their teams already to perform some of the activities, particularly literature searching (almost all interviewed), and at a much lower scale (no more than three or four interviewees) complying with open access publishing and deposit requirements, and grant writing. Interviewees were satisfied with those staff who were currently undertaking these specified "informationist" activities, (perhaps unsurprisingly, especially the interviewees were who were already performing these services for their teams).

Nevertheless, these interviewees still expressed a need for information support in other areas. For example, one researcher said that whilst a colleague performed all of the other nine activities for their team (BRC-R13), she wanted help specifically with literature searching, collaborative networks, and support of interdisciplinary research. Similarly, another researcher from a different Theme was in favour of receiving help with Bioinformatics ("...there's a plethora of wealth...we don't tap into that"), while "the rest of these...we do...self-taught" (BRC-R8). One Researcher was in favour of receiving

specific support in the form of training about RDM, bioinformatics, grant writing, and Collaborative Network Coordination (BRC-R9). Researchers at our third focus group were in favour of receiving systematic review training (BRC-R16 and BRC-R17).

Bibliometrics

Eight members of BRC staff (senior researchers, researchers, and research support staff) expressed themselves in favour of having an informationist or an information professional join their group to assist with bibliometrics. For example, researchers from one of the clinical themes all agreed at a focus group that this support would be beneficial; BRC-RS8 was in favour of this activity for the BRC and requiring impact factors; BRC-SR4 said that “we undersell ourselves”, and that their group does not know how to find out their impact. BRC-RS1 suggested that the BRC centralise the process of checking publications for acknowledgements of BRC funding. A focus group with another clinical Theme revealed that the group has a list of journals for which they would like to know the impact factors, a task specific to their needs, and one which would only need to be done annually. They said that this kind of “personalised service” would be “helpful”.

Bioinformatics

There were eight respondents who spoke positively about assistance with bioinformatics. BRC-R3 said that “it would be cool if you did that” about Bioinformatics, because they “make it up” at the moment, and submitting to GenBank [www.ncbi.nlm.nih.gov/genbank] is a “massive pain”. Submitting DNA sequences and querying the data is a problem, as was submitting genomes that they find to the repositories and databases. Concern was voiced that the library would have to “get an expert to teach” this material, and that other institutions promote week-long courses about it. BRC-R2, similarly, said that “It would be really useful to have someone with the knowledge to use NCBI, that would have saved me time”. He taught himself how to search NCBI for sequence data because “People don’t know around here, they haven’t used NCBI much”.

One of the seven Senior Researchers interviewed was in favour of having an informationist assist with this (BRC-SR4), as was BRC-R8, who said “Maybe this.. there’s a plethora of wealth [in bioinformatics]..and we don’t tap into that”. BRC-RS3 said that it’s “quite a hot area at the moment and I don’t know who else is doing it... This is quite a sexy area so I think it would be interesting to know what your niche might be within that”.

It is useful to note the comment from BRC-RS 4: “One of the sub-themes within the partnerships is Bioinformatics, so it’s quite specific I guess but...”.

Network Co-Ordination

Two of our interviewees were positive about receiving support with this activity. BRC-R13 said that she would like help with this, and BRC-RS7 said that their clinical Theme had “talked a lot about this”, because they “find in Oxford it seems to be quite difficult to mingle” and find out who their group can collaborate with. As a comparatively new research group, “I think collaborating and networks is definitely [something they] can really do with – help with”.

A more negative statement was “I don’t do any of that” (BRC-RS8). BRC-SR4 did not rank this activity as important.

Two people said that their group already has someone to do this: the departmental communications team (BRC-RS1), or a dedicated member of staff whose job it is “to see what different projects in

[specialty] are going on and where people can maybe share resources and..." (BRC-RS6). One Senior Researcher stated that "this is a project manager role, by and large" (BRC-SR6).

Copyright

Over a third of our interviewees were positive about receiving assistance with copyright issues, all of whom were in researcher or research support roles. The importance of this was picked up on by two others in research support roles, one of whom said that they recommend that people go to the library for help with this (BRC-RS1 and BRC-RS3). Two research staff members said that "I don't think any of us- anybody in my department would have an absolute clue to be honest"(BRC-RS7), and "People don't like.. understand at all" (BRC-R7). There therefore still seems to be need for library services to help with copyright issues.

We received a few negative comments about receiving assistance with this activity. A Senior Researcher said that this was not important for their group (BRC-SR4), and a Researcher said "Do we need to know about this?" (BRC-R8). This may be a matter of the library needing to raise awareness, rather than a comment on the lack of significance of assistance with copyright compliance, knowledge and understanding.

Lastly, one Researcher said that this is something that the Principal Investigator's Personal Assistant deals with ("...she'll find the forms, send them to me and I'll fill in the relevant bits and send them back"- BRC-R11). An awareness and understanding of whose role is which activity is significant here, as some activities are already performed by staff such as personal assistants within departments, leaving an embedded information professional the capacity to assist in other ways.

Grant-Writing

Interviewees were positive about this activity. A researcher in one of the focus groups told us: "Somebody might actually be useful for people at the start and then actually when they are assigned to certain groups and know a certain professor or PI would love or like his grant or paper to be written in a certain way, then they could feedback to the fellow or you know, to any person coming now, that this is the way it should be written for x and this is the way it should be written for y" (BRC-R15). He was in favour of having an informationist in the group who could get to know how the Senior Researchers wanted papers or grant proposals written, and then assist the new researchers with this task. A Research Support staff member was also in favour of this idea, as their "bosses" are "very busy and I think you know sometimes where it's just technical stuff more than it is the actual content and obviously a lot of people, if you've never written a grant, those application forms are just horrendous" (BRC-RS7). A Senior Researcher included the Grant-Writing card in the ones they ranked as important (BRC-SR4), and a Senior Researcher from a clinical theme was also in favour of this (BRC-SR1).

One research support staff member said that he was already involved with grant writing, as his responsibility was to assist with data management policies for the theme and the department, and grant bodies need to see such data policies in place. He said that if there was a centralised resource for this, "that'd be handy", and proposed that the library store a list of successful and unsuccessful grant applications to show researchers what they ideally need to include (BRC-RS1). A Researcher (BRC-R4) said in a focus group that they would like training or assistance with writing "grant applications in the most effective way.. how to catch attention to make sure your application is read. Communications – how to communicate with grant committees".

A few staff members said that it would be a challenging task to give to someone else to do because it requires specialist knowledge (BRC-SR6 and the attendees of the third theme focus group), it “depends what the support is” (BRC-R5), or that it was more suited for a postdoctoral researcher (BRC-RS6). Five staff members said that this activity was not relevant to them at the time (BRC-R2, BRC-R12, BRC-RS9, BRC-RS3, and BRC-RS5).

Otherwise, two staff members said that they “do this” (BRC-R1 and BRC-R8), or that the Research Design Service offer this service (BRC-R7).

Literature Searching

We described in Section 8.3.2 that a major part of the work of information staff in the UK, Europe and North America is in literature searching, as well as in teaching information literacy skills to users. We did not specifically ask interviewees and focus group participants about the information literacy skills training, yet as a result of talking to researchers in all roles, we improved awareness of our current services and the BHCL team have already held 1-1 training sessions with a few of the BRC staff members who requested them. The interviewees often conflated the two activities in their replies. This was the most popular informationist activity for our participants. For example, BRC-R1 is in favour of the literature searching services: “In depth literature searching, yes, it’s so nice, you know it’s brilliant”. Two senior Researchers (BRC-SR1 and SR4), the researchers who attended our first focus group (BRC-R4-6), research support staff (BRC-RS2 and RS3), a DPhil student and researcher (BRC-R3), were all in favour of receiving assistance with literature searching. Three researchers said that they would like help with this (BRC-R12-R14) and one research support staff member (BRC-RS4).

There were a few interviewees who thought that academics search Google and PubMed (BRC-RS10), and so do not require assistance from the library or from information professionals, or a researcher commented that literature searching is “important, but not something someone else can help with”, because you need to know the topic and know what is relevant (BRC-R2). On the other hand, he admitted that he was struggling at the moment to set up good search terms and retrieve useful references from Google Scholar, he was checking PubMed, and he said that receiving some training would help.

A few more negative comments were heard from Senior Researchers, one of whom stated that “anyone can use PubMed” (BRC-SR6), and the other saw no need for this service (BRC-SR5), as this person had research assistants in their team who could perform this task. The third focus group with one of the Themes concluded that an information specialist could not help with literature searches for their group because of the amount of interpretation required. This group requested a training session with the interviewer instead to show them how to use the tools, such as PubMed, because “you mutate your search as you go along”.

Network/ Systems Support for Translational Research

As Borromeo (2014 (97) writes, “Research networking systems hold great promise for helping biomedical scientists identify collaborators with the expertise needed to build interdisciplinary teams”. We had a few positive responses from the interviewees when prompted with this card for Question 4 in the interview and focus group. A Senior Researcher selected this card as being important for linking them to industry (BRC-SR3). Attendees at the third focus group that we held were also in favour of this. As with members of a newer theme who were looking for collaborators elsewhere in the University, a senior researcher told us at this focus group that this is “needed a lot at Oxford. Finding people at Oxford [is hard], and it’s no good Googling! Finding people who are interested in the same work as you are, at Oxford, [is impossible]” (BRC-SR7).

One researcher was ambivalent, saying that because she is not a medic, she is not able to do this (BRC-R12). A Senior Researcher was negative about this activity, saying that it was not important (BRC-SR4). In two cases, this activity is already being taken care of at the departmental level (BRC-RS1), or one theme already had someone employed in their team to do this (BRC-RS5).

OA/ Act on Acceptance(HEFCE)

Open Access and the Oxford campaign to ensure compliance with the HEFCE rules to “act on acceptance” have been promoted by staff at BHCL since 2013 and more actively since 1st April 2016 for members of the collegiate University. This has been a major activity for the Bodleian Libraries, and so it is interesting to note the responses of interviewees, as BRC-funded staff do not at present have to make their publications openly accessible, although members of the University will have to use Symplectic Elements to deposit manuscripts accepted for publication by journals within a three-month window.

Several interviewees gave positive comments about receiving assistance with Open Access requirements. One research support staff member said that “people do access the library for that” (BRC-RS2), or that it is “Always good to have a human who can advise about it” (BRC-RS3), one said that they had attended Bodleian Libraries training and was aware of the campaign (BRC-RS1), and one researcher said that he would ask a librarian directly for help with this (BRC-R3). A Senior Researcher said that it would be an important activity for an informationist embedded in their group (BRC-SR4), a new researcher was in favour of receiving assistance with this (BRC-R14), and one researcher told us that their entire department “would welcome some support in all of it” (BRC-R1).

A senior researcher in one group, the third focus group held with a clinical theme, complained that there was “no straightforward explanation from the scratch” about open access policy from the University, and that “you don’t know what you don’t know”.

Two researchers were ambivalent about open access, as they rely on other members of the team to deal with this (BRC-R12), or because it was not relevant to them (BRC-R2). One Senior Researcher and two others said that a personal assistant deals with open access issues for the theme (BRC-SR5, BRC-R11, BRC-RS7). One Senior Researcher said of Open Access and Bibliometrics, as described above, that both are “infrastructural things that should sit at the level of the Division” (BRC-SR6).

Reference Management

Our interviewees were generally positive about reference management support. For example, one research support staff member who uses Endnote commented that library training would be helpful for BRC staff who do not have University contracts and cannot access the IT Services training sessions that many of our interviewees said that they had attended (BRC-RS8). Two Senior Researchers from one theme selected this card as an activity they would like to receive support from an informationist embedded in their research group (BRC-SR3 and SR4). One researcher (BRC-R1) thought that members of their department would be keen to receive this support.

Research Data Management

Just as the literature suggests that this is now a significant part of library activity (see Bardyn (2012) (38)) for translational researchers’ views of RDM for example), our interviewees were also receptive to receiving this support. This was a popular card when ranked by interviewees for Question 4, with many people seeing a role for the library, or for an embedded informationist, with this. Two Senior

Researchers from the same theme both ranked RDM as important (BRC-SR3, SR4). Other researchers and research support staff were in favour of receiving RDM help from the library or an information professional (BRC-R8, BRC-RS3, BRC-RS5). One research support staff member suggested that an easy buy-in for the library would be to help with data management plans for clinical-facing staff, and for the library to offer easy, accessible RDM help and advice (BRC-RS10).

One researcher (BRC-R10) said that “the research data management is something we’re terrible on, I think. As in making research or data in a form that someone else can understand that’s not the primary researcher.” This, again, raises the concern about sharing data.

A research support staff member and a Senior Researcher saw a role for the library in cataloguing data (BRC-RS1 and BRC-SR5). BRC-RS1 was also concerned about long-term data storage.

One theme member talked about the possibility of employing a data manager for their group, someone to manage shared drives and databases (BRC-RS7). One group already has a data manager (BRC-RS8). A few staff members were ambivalent about RDM (members of our second focus group – BRC-R15, RS11, RS12; BRC-R14). One researcher at the first focus group said that they all had different data which was project-specific, and there was no “one-size-fits-all for how the library can help with that” (BRC-R6). Lastly, a researcher said that she was not interested in RDM services, on the grounds that she is “not in charge of that” (BRC-R12).

Reviewing, Editing and Co-Authoring Articles for Publication

Several interviewees and focus group participants were interested in receiving this service from an information professional. In our first focus group with researchers belonging to a clinical Theme, they asked the interviewer if the library service currently help with writing reviews, reviewing papers once they are written to see what is missing, assisting with editing? One researcher suggested that editing assistance from the library for new DPhils who are writing their first poster, maybe for an international conference, would be helpful, as would be “journal editing support” for first time students. Supervisors would be happy to receive papers that the library had helped with for them to polish, instead of spending a lot of time on the editing tasks (BRC-R5). All of the attendees concluded that they would like to have someone join their research team to help with reviewing, editing, and co-authoring articles for publication (BRC-R4, R5, R6).

A Senior Researcher was interested in this service (BRC-SR 4), as was another researcher (but only “up to a point”) (BRC-R12), and a research support staff member (BRC-RS9). One researcher was in favour of receiving help with this because of the value of “having an extra pair of eyes. Especially someone who’s outside the immediate specialities, is always helpful” (BRC-R11).

One department already has someone in post to deliver this service, although again the staff member was in favour of additional support from “Someone to sit and talk with researchers..., checking grammar” (BRC-RS1).

A handful of staff members said that this service was not relevant to them (BRC-RS8, R2, R3). Otherwise, at the second focus group, one researcher commented that “You’d ask your colleague for example to have a look [at a paper] but not for a librarian to edit and co-author a paper or re-draft. Whether a librarian would add here, I don’t know... to edit or co-author a paper, I don’t know. I have no experience with that, you know. To ask a librarian for that” (BRC-R15). This implies that researchers are not familiar with the idea of asking librarians to help with this activity. One Senior Researcher stated that “you need specialist knowledge” for these activities, and that they are best suited to a postdoctoral student or a fellow who “wants out of a traditional research career” (BRC-SR6).

Support of Interdisciplinary Research

Seven BRC staff members were interested in this activity. One Senior Researcher saw a role for the library service in signposting researchers to the right services by questioning them about their information needs and making them aware that they may have different information needs at later stages of their BRC project, and that the library service should have a role in the Knowledge Transition stage of some of the Theme's work (BRC-SR2). Two research staff members commented on how useful it would be to have someone to "bridge that gap" in teams between different staff "who don't even use the same language as you" (BRC-RS3), or someone who has "those contacts and bridges across" to build up interdisciplinary networks (BRC-R11).

In contrast, one Senior Researcher was clear that this was not of interest to them (BRC-SR 4), one researcher said that there was already someone in their group who performs this role (BRC-R13), and two research support staff members said that this is the role of the BRC ("This is what the BRC is doing! It brings people together" –BRC-RS1; BRC-RS4).

Other Comments about the Informationist Role

Three Senior Researchers and one Researcher were vocal in their support of having an informationist or other information professional join their research group. For example, after discussing the 12 informationist activities on the cards and ranking them, one Senior Researcher's comments are worth noting in full:

"Money no limit. Well you could align yourself with all parts of the research journey from, what is the research question?, to where are we going to get the money from?, to which grant funding bodies provide what grants at what times, to you know.. it's interesting.. the background literature search, to doing the linking with the statisticians, to say, this is how you need to analyse this, to which journal should we publish it in. So you could, I think, have a role at different stages, of going from what is the question to this is the paper." (BRC-SR1).

BRC-R11 commented that, "I imagine if there was someone who had this skill set, then they would be used more and more. I think it's knowing someone's there and also it's always a bit awkward asking someone else to do something that you can do [yourself]..."

One researcher at the first focus group that we ran was keen to delegate tasks to an informationist: "Everything. I'd delegate everything. Students, nights, small groups, everything" (BRC-R4).

Our interviewees had a few other suggested activities for an informationist:

- A signposting webpage with services for researchers would be helpful (BRC-R1).
- A Senior Researcher thinks that the library will have a role with the Knowledge Transition stage (BRC-SR2).
- Manage researchers' outputs for ResearchFish and other sources by recording publications, engagement, and industry collaboration, updating a database every six months (BRC-RS10).
- Measure the impact of any given academic or researchers' published work every few years (BRC-SR4).

Some of the activities and tasks are undertaken by research staff at present and some research support staff often noted that they were undertaking some of these tasks themselves or knew another member of the team who had that responsibility. In those cases, interviewees were satisfied with the

staff who were currently undertaking the specified “informationist” activities, especially (perhaps unsurprisingly) those interviewees who were who were already performing the informationist services for their teams.

However, it should be noted that with the exception of literature searching (carried out by most interviewees), this was a very patchy picture with no activity flagged by all interviewees as being already carried out by colleagues. For example, only four interviewees mentioned that a colleague already supported them with open access publishing or with grant writing and those were the two most frequently mentioned areas after literature searching.

The gaps in expressed, or perceived, needs which were not mentioned at all as being undertaken by other staff in the team were bioinformatics resources and tools, RDM, and support of interdisciplinary research.

Would staff welcome an informationist joining their teams?

When we interviewed staff from 12 of the 20 Oxford BRC Themes, a question in the interviews and focus group schedule was, “Would it be helpful to have someone join your team to provide support?” Three Senior Researchers and four Researchers from four of the 12 themes were vocal in their support of having an informationist or other information professional join their research group. For example, after discussing the 12 informationist activities on the cards and ranking them, BRC-SR3 said: “...I think library services should be much more involved in, like, the active research...Well, you see that’s it, if you were to tell me you could do all of this now, I’d be like “that’s amazing”, I’d get you on board now.” They went on to say that “I’d be happy to delegate stuff completely if I knew that that person had the right skillset.” Similarly, BRC-SR4 described the following scenario:

“...So I’m busy doing my thing and happy doing it but I’ve come up against a wall or I’m uncertain. Then maybe Eli, what I need is your experience and maybe what to do is be able to press a button, not to summon you up but actually to say, I’ve got a question for you and then you say, no problem, fill in this half page form, tell me what the problem is and I’ll see if I can help from an informationist point of view...you want to have access all the way through the various experience of the University and that means helping at the very high level, the mid-level and then the entry level. That would be my view.”

The third Senior Researcher’s comments are also worth noting in full:

“Money no limit. Well you could align yourself with all parts of the research journey from, what is the research question?, to where are we going to get the money from?, to which grant funding bodies provide what grants at what times, to you know...it’s interesting...the background literature search, to doing the linking with the statisticians, to say, this is how you need to analyse this, to which journal should we publish it in. So you could, I think, have a role at different stages, of going from what is the question to this is the paper.” (BRC-SR1).

BRC-R7 said of their theme, “I think everyone over there would welcome some support in all of it”. BRC-R11 commented that “...certainly some or all of these would be very helpful. Whether we generate enough of this work, as a team, to have someone there all the time, I don’t know. So I suppose it’s one of those things that once it becomes...once there is someone who is able to help with these things, they will be used more and more and their role will grow.” They also said, “I imagine if there was someone who had this skill set, then they would be used more and more. I think it’s knowing someone’s there and also it’s always a bit awkward asking someone else to do something that you can do [yourself]...”

One researcher at the first focus group that we ran was keen to delegate tasks to an informationist: “Everything. I’d delegate everything. Students, nights, small groups, everything” (BRC-R4). A researcher at the second focus group said:

“That could have been useful, for example, when I started here in the first couple of weeks, you know. You certainly haven’t written a grant, you haven’t done any of this. Maybe if you have somebody, you know, who is designated to this particular group. He or she could actually help you, at least at the start, to you know...because the first draft was awful. I got a lot of red lines through it you see. And you see you learn by this. Somebody might actually be useful for people at the start and then actually when they are assigned to certain groups and know a certain professor or PI would love or like his grant or his paper to be written in a certain way, then they could feed back to the fellow or you know, to any person coming new, that this is the way it should be written for x and this is the way it should be written for y.” (BRC-R15)

Aside from these responses clearly for and against the question about having an informationist or another information profession join the interviewees’ research teams, there were many more ambivalent answers. Some interviewees did not see a need for an informationist or embedded information staff member to join their team to perform those tasks that were already being done within their groups, such as bibliometric analysis or meeting open access publishing and policy requirement. However, most of the interviewees saw a role for an information or library professional assisting their team with at least some of the specific activities from the 12 listed on the cards.

For example, one researcher said that she wanted help specifically with literature searching, collaborative networks, and support of interdisciplinary research, but that an existing member of their team performed all of the other nine activities for their team (BRC-R13). Similarly, another researcher from a different theme was in favour of receiving help with bioinformatics (“...there’s a plethora of wealth...we don’t tap into that”), while “the rest of these...we do...self-taught” (BRC-R8).

In other examples, one Researcher was in favour of receiving specific support in the form of training about RDM, bioinformatics, grant writing, and collaborative network coordination (BRC-R9). Researchers at our third focus group were in favour of receiving systematic review training (BRC-R16 and BRC-R17). Senior Researcher (BRC-SR6) was in favour of training to improve staff’s efficiency in using “PubMed, Google, EndNote”.

Similarly, various Research Support staff were in favour of the library service providing support specifically about “bioinformatics resources” (BRC-RS5; also BRC-RS6), or for “systematic review training”, and training in reference management programmes for staff who cannot attend sessions held by the University’s IT Services (BRC-RS8). Advice or instruction in collaborating and working “with different people who use a different language”, those coming from different specialties, was welcomed by BRC-RS3, along with support specifically for literature searching, copying, open access, support for interdisciplinary research, and bibliometrics.

Our interviewees had a few other suggested activities for an informationist:

- A signposting webpage with services for researchers would be helpful (BRC-R1);
- A Senior Researcher thinks that the library will have a role with the Knowledge Transition stage (BRC-SR2);
- The role of this current project is to map the information needs of researchers to services (BRC-SR2);

- Manage researchers' outputs for ResearchFish and other sources by recording publications, engagement, and industry collaboration, updating a database every six months (BRC-RS10);
- Measure the impact of any given academic or researchers' published work every few years (BRC-SR4).

This data suggests that the library service can play a key role in providing targeted training to meet these information and training needs, either from the library or in the form of embedded help from library or information professionals.

This kind of targeted training is a core service provided for many biomedical researchers, as noted in Sections 8.1.1, 8.1.2 and 8.2.1, and the data from our interviews with library and information professionals, in Section 8.2.2.

Some reservations were expressed by some of the interviewees about the range of informationist activities that could or should be undertaken. The reservations concerned:

- Lack of knowledge (activity not important to them personally)
- Lack of awareness of recent changes (e.g. open access, copyright).
- Perceptions that another part of the BRC was or should be responsible.
- Amount of specialist domain knowledge required for the activity (e.g. some aspects of data management).
- Perceptions that the activity was integral to being a successful researcher (e.g. some aspects of literature searching – knowing the field).

However, only one Senior Researcher was not at all keen on the idea, noting that "I don't think that anybody could do that [referring to the 12 activities] who wasn't a domain expert... for the bread and butter work of our research on a daily basis I just don't think somebody without the domain expertise would be able to do that" (BRC-SR5). The only role they saw for the library was in cataloguing data for secure storage and access.

8.4 Informationist Skills and Knowledge

KEY MESSAGES

Core informationist skills vary according to the research setting, and depend on the way the service has developed but the literature does flag a common set of “core” skills and knowledge required.

There is no single career route into an informationist post. Some research informationists may have scientific or clinical qualifications, or may need to earn them, but others may acquire the necessary knowledge and expertise by learning on the job.

Key personal attributes emphasised in literature and in our interviews include importance of team working skills, interpersonal skills, scientific curiosity, creativity, and a willingness to take the initiative to develop new services.

Informationists all seem to benefit from some education and training to gain additional expertise. Education provision may be formal or informal, external or internal, and may involve domain knowledge (e.g. life sciences, and/or computer science) or technical skills (e.g. research data management).

The future trends for informationist services in the US suggest that they will continue to develop specialist RDM and Bioinformationist services for research groups.

8.4.1 Core Informationist Skills and Knowledge

Evidence for the skills and knowledge required by informationists

Core informationist skills vary according to the research setting, and depend on the way the service has developed. The set of cards indicating informationist activities for interviewees was based on articles in a special issue of JMLA October 2013 (13, 44, 83). This section analyses the skills and knowledge that would be required for each activity, together with some supporting evidence, mainly from the literature but also from analysis of recent job descriptions for informationist posts, and responses from North American informationists.

In our interviews, the challenge was raised by LIS of how to embed a librarian who does not have a particular specialist background in a research group with that speciality? What upskilling would be needed? Is it a viable option? Wu and Mi (25) argue that embeddedness requires librarian job redesign, and that individual librarians will need to gain new skills to take on the roles at the level outlined in their model (which provides information about the knowledge and skills recommended for Levels 1-5), and so training opportunities must be made available. Likewise in terms of the skills required to develop RDM services, Cox et al (80) found in their survey of international library support for RDM that their UK respondents said that “building staff confidence in this territory” is a major challenge. Lyon (50) found similar “practical challenges in up-skilling existing staff working in academic libraries” in relation to RDM services.

Those in informationist roles may have undergraduate or postgraduate qualifications in a scientific discipline, with a later information management qualification. A common alternative model at present is the librarian with domain experience acquiring additional data management skills to support

research data management and bibliometrics with teams, particularly for multidisciplinary research. In large North American academic health care libraries there may be several informationists working in different roles, ranging from those supporting clinical practice (similar to clinical librarians) to those embedded in research teams. Many informationists educate and train research staff as part of their work, and most of the research lifecycle activities listed require some specialist expertise from the informationists.

To train staff to perform the twelve informationist activities, the evidence from job description analysis and the literature reveals that for bibliometrics (which is used for research evaluations, or impact factor calculations), methods and tools for assessing research productivity and impact of individuals and teams, along with citation analysis and social network analysis are required (91, 120). NA-I1 reported that they perform a lot of the education and training about bioinformatics resources (such as the NCBI databases) and tools, stating that they have provided “documentation and instruction for locally-developed bioinformatics tools, seminar programming, project management, and software licensing, all with a focus on bioinformatics”. The literature and job description analysis shows that additional skills and knowledge about bioinformatics resources, databases, tools, and data analysis are required (59, 73, 85,121), along with biomedical or bioinformatics subject knowledge. Collaborative network co-ordination is about e-science and virtual research environments, which requires project management expertise (122,123), as well as general education and training.

Copyright is a fourth informationist activity which is often featured in job descriptions. This requires knowledge about the legal issues around copyright, and the types of licences (124). This is an activity that LIS3 and LIS4 reported being involved in.

Grant writing is an informationist activity which requires knowledge about funders, policies, and requirements (63, 100). The job description analysis showed that database searching skills are also valued for this task. NA-I3 wrote that “Researchers can rely on Informationists to identify previous studies, gaps in published literature, and funding opportunities for grants.”

This leads to the sixth activity: literature searching. This can be both for systematic reviews or for other specialist reviews. This requires advanced information retrieval techniques, knowledge about databases, and about systematic review tools (83, 99, 121, 125), as well as basic scientific and clinical knowledge. NA-I3 and NA-I4, along with several of the LIS interviewees (LIS1, LIS2, LIS3, LIS7, LIS8), referred to the significance of this role (“most” of LIS7’s work involves “undertaking literature searches for systematic reviews and similar projects”, for example).

Open access publishing and deposit requirements is an informationist activity described both in the literature and in the job descriptions. It requires skills and knowledge about the legal aspects and requirements for open access publishing, funders’ requirements, and about scholarly communication processes, including the use of social media (13, 44, 124).

Network and systems support for translational research (covering basic, clinical, and population-based research) requires skills and knowledge about public health, how to implement best practice, health information literacy, as well as general education and training (118, 126, 127). This is backed up by the job description analysis.

Reference management and personal information management support requires knowledge of the appropriate tools and the various citation styles (13, 44), as well as social media tools, and education and training, as illustrated in the job description analysis.

Research data management (RDM) is the organisation of data, descriptions of data, stewardship of data collections, and which refers to shared data and open data requirements. This is a major theme

in the informationist literature, as well as in the interviews. This activity requires knowledge of the ethical and legal aspects of RDM, data management planning, the research and data lifecycle, metadata requirements, as well as database design (18, 21, 35, 71, 91, 103, 128, 129). NA-I2 said that “support for data science as a distinct scientific discipline/methodology requires specialized support from an informationist with subject matter expertise in addition to training in information science”, highlighting the importance of having physical or life sciences knowledge.

Reviewing, editing and co-authoring articles for publication is an activity which requires knowledge about scholarly communications processes (63, 124), and which the job description analysis reveals to be a further requirement for informationist posts

Finally, the twelfth informationist activity is the support of interdisciplinary research. This requires basic knowledge of science and medicine, along with project management skills, and developing data dictionaries (71, 73, 104, 123).

8.4.2 Attributes of informationists

Informationists work as embedded librarians, based in the research setting, rather than the library. Most studies emphasise the importance of team working skills, interpersonal skills, curiosity and creativity, and a willingness to take the initiative to develop new services (review by Schulte *et al.* 2012) (69). Four attributes have been identified. Firstly, they need to be team workers and knowledge brokers (130), which is backed up by the job description analysis, and the fact that most of the information specialists and informationists who were interviewed work in a team (LIS6, LIS7, NA-I2, NA-I3). The second attribute is to have initiative, in order to develop services and respond to needs, which is a quality often referred to in the job descriptions, and which is referred to by LIS7, LIS9, NA-I2, NA-I3. These LIS staff are all in successful services as a result of this quality. Thirdly, informationists require scientific curiosity and persistence (84, 99). As NA-I1 states, “the desire to learn is important”, and “it does help to have a genuine curiosity and an interest in learning” (NA-I2). Lastly, interpersonal skills are essential to the role, as stated in the literature (76), in the job descriptions that were analysed, and in the interviews with LIS staff, as several mentioned the need to “engage with researchers”. (LIS1, LIS2, LIS4, and LIS5). The need for good listening skills is alluded to by NA-I2, who talked about learning “a lot about ways I can help them better” when researchers “talk about their work”.

8.4.3 Informationist education and training

Informationist roles vary, and the range of knowledge and experience that potential informationists bring to their roles also varies. There seems no “one size fits all” programme and education and training usually involves acquiring additional domain knowledge (for the non-clinically trained informationists), and technical expertise (e.g. in research data management tools and techniques, statistical methods for bioinformatics) and communication skills, for working within interprofessional networks. Short courses, stimulating and supportive working environments, with plenty of opportunities for career development are advocated for good medical informatics research by Haux 2014 (131), and the same seems to apply to research informationists.

There is a range of professional development programmes and opportunities (most examples, apart from research data management, come from North America). There is a Biomedical informatics training course (the Woods Hole course) in the USA (76), which NA-I1 attended. There is in-house professional development available in the USA as well, such as NIH support for informationists to be attached to NIH-funded research projects (73, 132-134), and NIA supported training (135). In Europe, training for research data services is likely to involve collaboration across academic libraries (113), or

there are inhouse programmes in RDM (as at Oxford) (136). Finally, there are programmes in health informatics, or bioinformatics (137), which often include interprofessional training (for example AMIA clinical informatics) (138).

8.4.4 Future trends

The NIH public access policy in 2008 appears to have spurred development of biomedical research support services among health libraries in the USA, and more mature informationist services have developed more specialized services with a team of informationists, as we saw in Section 8.2.1. These include research data management services tailored to the needs of biomedical researchers, or biomedical informatics/bioinformatics services. Much depends on the way the relationship develops between the informationist appointed and the research team (73), as most researchers appreciate services that are tailored to the needs of the team. This was a finding that we have reported in Sections 8.1.4 and 8.2.3, and was also a finding in a recent report about an embedded librarian project for an Engineering Department (1).

North American academic libraries have been developing research data management services for the last decade. A report for the Association of College and Research Libraries (139) found that a minority of libraries were offering research data services (mostly larger institutions with NSF grant-funded research staff) but many more libraries were planning services. Most would reassign existing staff to research data services, with training provided externally at conferences or workshops. Libraries usually co-operate with the research support office to provide training and other research data services (e.g. advising on data management planning (20); technical support for data repositories (140)). The level of maturity of services on offer varies (80), as do the required skills and knowledge of research data management support staff (141).

Bioinformationist specialties often focus on the immediate application, and manipulation, rather than just management, of clinical research data. The skills and expertise required often include some computer science expertise (142). A variety of training programmes exist (137), with skills and knowledge including knowledge of programming, statistics, domain knowledge and communication skills to understand needs of individuals and organizations and work effectively with them.

Embedded informationists from the health library may form part of the team, with emphasis on the communication and networking required, or the vocabulary aspects of data linking. In a bibliometric analysis of the literature on big data research in health care, Gu *et al.* 2017 (143) suggest that such research will focus on early detection, prognosis and treatment of disease, data mining and machine learning and health care services tailored to individual needs. An example (144) of some of the work required for international collaboration includes dealing with privacy among different biobanks, accessing and searching heterogeneous information systems and data linking when vocabularies vary. Using biomarkers for personalized medicine depends on access to data from many resources – national and international, and requires good data stewardship (145).

8.5 Promotion and Awareness

KEY MESSAGES

16 of the 42 interviewees reported variously acting as a barrier to their uptake of library services: a lack of awareness of what is available to them; a lack of time and/or the effort to find information; and/or a lack of clarity on the role of the library versus other service providers; and about skills that they were missing or lacking.

Findings from participants and the literature suggests that short, simple messages about services should be targeted to specific groups through a variety of methods.

Our interviewees consistently suggested that the best people to promote library services are the librarians (or information professionals, informationists) themselves.

The importance of personal contacts was stressed by several interviewees including one-to-one meetings; librarians attending/hosting seminars; and a library presence at welcome events and open days.

The importance of “word of mouth” recommendations was also flagged by researchers and information specialists interviewed.

Interviewees all mentioned methods of promotion recommended by authors in the literature including: directly targeted and general emails; library presence on departmental webpages; social media including YouTube and Twitter, as well as “vox pop” videos or podcasts; and more traditional routes such as noticeboards, newsletters, and library materials in new staff induction packs.

All of the above is supported by the literature reviewed.

Promotion and awareness is an essential part of providing services to researchers and the literature provides numerous examples of this. For example, Brandenburg *et al.* (116) write about an evaluation of their Laptop Librarian programme, a service at the National Cancer Institute’s Frederick Scientific Library, which consisted of librarians working from laptops in departments in order to answer enquiries. Promotional efforts included placing signs in the locations, emailing announcements about each session, five-minute presentations at lab meetings, and fliers about the service (116).

Goode and Anton conclude a 2013 paper about an informationist’s collaboration with a department by noting that “Proactive library service promotion was fundamental to finding a new research collaborator in Radiology” (99). The importance of promoting a research support tool is also highlighted by Reich *et al.* in a 2013 paper in which they argue that these activities need “to be done frequently and via as many communication venues as possible” (146). There are several references in the literature to the need to promote RDM services with appropriate messages and printed “promotional materials” (105), or the more general need to promote “awareness and use of the libraries’ data-management plan templates and repository” (147).

8.5.1 Challenges and barriers to promotion and awareness of information and support services

The literature identifies a number of challenges and barriers relating to promotion and awareness. Smith *et al.* include lack of awareness about library services, “Patron preference for interacting with a person” (which means that one of their nine interviewees said that they wanted “a point of contact to call for specific information”), “Barriers to sharing information”, and “general challenges related to the complex university environment” (such as “Knowing what is available, where to go to see what is available”) in the findings from their information needs assessment of the North Campus Research Complex residents who conduct translational research at the University of Michigan (59). Haines *et al.* also found that their basic science researchers had a lack of awareness about library services (57).

Many of these challenges/barriers are evident in the Oxford context. Acting as a barrier to their uptake of library services interviewees reported variously: a lack of awareness of what is available to them; a lack of time and/or the effort to find information; and/or a lack of clarity on the role of the library versus other service providers; and about skills that they were missing or lacking.

In the context of library services, one interviewee told us that they had just published a review paper for which they had searched for the literature themselves because they did not know about the library service, or what we can help with (BRC-R4).

A Senior Researcher said that “scientists” in particular “A) don’t know that they can, B) they don’t know what you can offer, C) they don’t know whether they’re asking a really stupid question or you’re the wrong people to ask” (BRC-SR3). Another interviewee said that people don’t know what they need, and they don’t know what they don’t know about our current services (BRC-RS10). When the interviewer elaborated on current BHCL services to one researcher, they responded with “That’s useful to know. I didn’t know that sort of service existed actually” (BRC-R11).

Participants at the second focus group said that they “Didn’t know that was there on offer”, and “I wasn’t aware of the outreach”, in response to a similar explanation by the interviewer (BRC-RS11, RS12). Indeed, one researcher said that “the librarians are not well advertised” (BRC-R3), or a staff member said “...I’m not sure that it’s widely understood that, you know, by working with...one of the specialist subject librarians...that they could actually save themselves a lot of time and effort” (BRC-RS3).

One researcher said that “As nurses, we let ourselves down academically, we feel like we don’t need those skills”, suggesting a lack of awareness about skills (BRC-R13).

A number of interviewees mentioned that they had not known about our services until they were interviewed by a librarian who could tell them exactly how the services could benefit them (BRC-R12, RS11, RS12). As a Senior Researcher commented, “... I guess that’s what this exercise is partly doing” (BRC-SR5). This was echoed by a researcher at the third focus group who had a specific information need: “It’s good that you’re here, because it’s not clear how to contact the library” (BRC-R16). Another Senior Researcher said that he would remember the meeting that day with the interviewer because the interviewer had visited him in person, highlighting the importance of personal contact.

A lack of clarity around roles and remits was a barrier for three interviewees, linked to a lack of awareness about the library services, and the need for the library to promote services more effectively and widely. “I don’t understand where the library ends and IT starts”, as one Senior Researcher said (BRC-SR5). Another Senior Researcher said that, “I don’t know how wide your remit is in the information centre, whether it would extend for example to enabling people to digest information

better and the sort of front end of the presentation of our data to the public and stuff like that as well. I don't know how far it goes." (BRC-SR4).

8.5.2 Suggestions for improving promotion

The literature outlines the following various ways of improving promotion. Grefsheim *et al.* (2007) found that it was valuable to target user groups such as extramural staff who may not know as much about what is available; the importance of a robust search engine on the library website to save time; and that email and/or telephone was preferred to interactive reference sessions such as Chat (117). The laboratory scientists interviewed by Haines *et al.* recommended that having a library presence on departmental web pages was a good way to communicate about available library services, and suggested that the library was proactive in integrating information into sites that the scientists were already using. Their participants favoured emails, suggesting that the library staff used departmental administrative assistants to circulate news (57).

From Tomaszewski's (2012) survey of PhD students and postdoctoral scholars from science departments at one university, he finds that "there is a need for marketing subject librarians to this library community", and suggests that this is done through online or face-to-face workshops and induction sessions. Tomaszewski concludes that "Science librarians should also consider using social networking channels such as Facebook, LinkedIn, and text messaging to reach more doctoral and postdoctoral researchers, although further study to determine the effectiveness of these tools is warranted" (51).

Vaughan *et al.* used their research findings to market the services that their library could offer researchers at each stage of the research lifecycle, using posters around the campus, as well as "through visibility at conferences, meetings, and office hours". The team advocate "outreach to researchers" (63).

As a result of Cain *et al.*'s HSL@Emory study in 2016, their team produced print and online information about "grant, fellowship, and scientific writing...and a new "Writing and Publishing" section added to [the library's] redesigned website". They also focussed energy on "raising awareness of existing services, such as reference management assistance, research impact assessment, copyright management, and NIH public access compliance" (14).

LIS professionals we interviewed talked about the ways in which they promote their services to their user groups, and in some cases this activity forms an appreciable part of their role. Communicating the scope of a role at meetings with researchers, what the information professional can do for researchers, was a subject mentioned by LIS2 and LIS3, for example. LIS2 has a list of researchers who are funded by one body, and she cold-calls them about their research projects, talking about how to collaborate with them, or organising further meetings and workshops. She said that she was told by her manager to "make a nuisance" of herself, to get out and talk to people. LIS3 also said that by nature she is a "shy wilting flower", but in her post she tells people who she is, she attends training courses and uses word of mouth to promote her role.

LIS5 talked about how she promotes the institutional repository by including information in a RD&E newsletter, going to events with a display stand, and by talking to people at events. LIS6 promotes their data management services using the "usual ways", with posters up around the University, a brochure to promote their services, and short training sessions at research, IT, or library committees. They also target on-demand workshops with researchers, attend departmental seminars in the different departments in the institution, and tailor workshops for disciplines. LIS10 also uses a brochure to promote services, along with courses and email. LIS7 was starting to promote their services more to increase demand and prove their value to the institution by offering training and

advice classes, seminars, any meetings which gives them contact with researchers and the opportunity to talk about what they do. She works by finding champions who value what they do and can promote their services, again, through word of mouth. LIS9 wrote that they talk to “Professors in research and the clinics, hoping for word of mouth”, as well as giving “Presentations to research-intensive departments”. LIS8 said that they promote themselves online for people who are not at their University, and their team use Twitter and YouTube, as well as blog posts for newsletters.

One example of promoting services as an activity in itself comes from Brandenburg et al, who write about an evaluation of their Laptop Librarian programme, a service at the National Cancer Institute-Frederick Scientific Library which consisted of librarians working from laptops in departments in order to answer enquiries. Promotional efforts included placing signs in the locations, emailing announcements about each session, five-minute presentations at lab meetings, and fliers about the service, which “were distributed on campus” (Brandenburg, 2010). Goode and Anton conclude a 2013 paper about an informationist’s collaboration with a Department of Radiology by noting that “Proactive library service promotion was fundamental to finding a new research collaborator in Radiology” (Goode, 2013). The importance of promoting a research support tool is also highlighted by Reich et al in a 2013 paper in which they argue that these activities need “to be done frequently and via as many communication venues as possible” (Reich, 2013). There are several references in the literature to the need to promote RDM services with appropriate messages and printed “promotional materials” (Henderson, 2015), or the more general need to promote “awareness and use of the libraries’ data-management plan templates and repository” (McLure, 2014).

The replies from our informationists and embedded librarians interviewed, replies covered a number of areas including, the importance of general promotion and communication (e.g. cold calling researchers about projects, discuss collaboration, organising meetings and workshops, attending training courses to promote role.); making use of “traditional” media such as including information in a departmental newsletter, going to events with a display stand, posters around the University, brochures to promote services; word of mouth - finding champions who value services and can promote them; and online options such as Twitter and YouTube, blog posts, and emails.

The need to communicate effectively with users was an issue mentioned by LIS1, as she had found that using terms such as “information literacy”, “information” and “managing information” is meaningless for researchers. This is librarian jargon. She recommended that BHCL staff ask about how researchers manage their information in “new and exciting ways”. Similarly, NA-I3 wrote in response to the question, “What are the main challenges in your role today?”: “...communicating what our expertise and role is in order to advance research, education and clinical practice. Many users still equate librarians with books and buildings, and they still do not fully appreciate the work involved in competent searching, appraisal of information and challenges of scholarly output, metrics and dissemination.”

LIS5 and LIS6 both raised the problem of getting users engaged with their services, communicating services to them, as a result of institutional cultural change. Both of their organisations are asking users to engage with a research repository or with data management services. LIS6 said that they started with postgraduate students, who are easier to change and who are keen to manage their own data. It was more difficult with mature researchers and PIs to ask them to attend a course. Awareness-raising for both of these professionals has been challenging.

It is interesting to note that LIS8 said that they do not promote their service: “We’re too busy!” In the literature, Erdmann picks up on the “marketing challenge and opportunity” for libraries in making scientists aware of research data services, for example (Erdmann, 2015). There are few other authors who see marketing and promotion as a challenge, beyond Smith et al’s conclusion at the end of their

information needs assessment that “raising awareness and marketing library services is an ongoing challenge” (59).

The need to communicate clear messages about what librarians and information staff can do for users was echoed by our BRC staff in the interviews and focus groups held with them.

Many of the suggestions, or variants of them, from the LIS staff interviewed and from the literature also arose in our focus groups and interviews with Oxford BRC staff. A wide range of options were suggested – rather neatly summarised by one interviewee, “...I think you just have to get it out in as many places as possible”, albeit with the caveat, “In as few words. It’s got to be short or people won’t read it.” (BRC-RS4).

The most frequently mentioned methods of promotion included email (including targeted emails and “an email contact” for researchers in different departments); leaflets, posters and noticeboards; and Web 2.0 options such as podcasts, pop-up help boxes on library Webpages, and YouTube videos. Our interviewees consistently suggested that the best people to promote library services are the librarians (or information professionals, informationists) themselves – via a range of routes including presentations at researcher events/seminars and a presence at welcome events and inductions for new staff/students, targeted emails, and individual meetings.

Another theme coming through the data is the need for the library to communicate directly to researchers clear messages about the services we can offer, such as the comment from the Senior Researcher about communicating to biomedical and health care researchers that the library services “can make you more efficient”, and can help with “PubMed, Google, Endnote” (BRC-SR6). Along with one researcher (BRC-R13), a research support staff member suggested that the library “...can use in your straplines ‘We can make your lives easier’” (BRC-RS3).

As a Senior Researcher said, “...I think the research informationist, the librarian, whatever you want to call the person, needs to go from being a passive recipient to whom we go to, to being...active”, in order to “be partners I guess in the research” (BRC-SR1).

Some of the interviewees also mentioned the importance of word of mouth, noting that they had heard about the library services because other colleagues told them (BRC-R12), or recommended a specific service (BRC-R5, R15). For example, one BRC staff member said that “...everybody keeps telling me about the library and I’m like ‘oh yeah, it sounds really good I should go’” (BRC-RS7).

Appendix 1: Databases searched for literature review and Ovid Medline search strategy

Database	Search date
CINAHL bibliographic (EBSCO; 1981–)	02/03/17
Embase.com (1974–)	06/03/17
Library and Information Science Abstracts (LISA) (ProQuest; 1969–)	02/03/17
Library, Information Science & Technology Abstracts (LISTA) (1964–)	06/03/17
MEDLINE (Ovid; 1946–)	02/03/17
Scopus (1966–)	06/03/17
Web of Science (1900–)	06/03/17

Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present

(Search date 02/03/17)

- 1 informationist*.mp
- 2 Biomedical Research/mt [Methods]
- 3 Data Mining/mt [Methods]
- 4 Information Storage and Retrieval/mt [Methods]
- 5 Information Management/mt [Methods]
- 6 "data management".ti,ab.
- 7 ("project lifecycle" or "project life cycle").ti,ab.
- 8 bioinformatics.ti,ab.
- 9 "data literacy".ti,ab.
- 10 "data mining".ti,ab.
- 11 ("literature searching" or "Scholarly Communication" or copyright or "reference interview*" or "information literacy" or bibliometric*).ti,ab.
- 12 OR/2-11
- 13 Librarians/
- 14 Professional Role/
- 15 (librarian* or "information specialist*" or "information scientist*" or "research specialist*" or "embedded information*" or bioinformaticist* or "research information technologist*").ti,ab.
- 16 ("library staff" or "information officer*" or (information adj3 manager*)).ti,ab.
- 17 OR/13-16
- 18 12 AND 17
- 19 1 OR 18
- 20 limit 19 to yr="2006 -Current"
- 21 Libraries, Medical/
- 22 Library Services
- 23 Medical Informatics/
- 24 17 OR 21 OR 22 OR 23
- 25 ("bio medical*" adj3 research*).ti,ab.
- 26 (biomedical* adj2 research*).ti,ab.
- 27 (health care adj3 research*).ti,ab.
- 28 ("health care" adj3 research*).ti,ab.
- 29 (translational adj6 research*).ti,ab.
- 30 (lab* adj2 research*).ti,ab.

31 research nurse*.ti,ab.
32 (postdoc* or "post-doc*").ti,ab.
33 scientist*.ti,ab.
34 Biomedical Research/
35 Research Personnel/
36 34 AND 35
37 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 36
38 24 AND 37
39 limit 38 to (english language and yr="2006 -Current")
40 Needs Assessment/
41 Information Seeking Behavior/
42 (information* adj2 access*).ti,ab.
43 (information* adj2 seek*).ti,ab.
44 (information* adj2 want*).ti,ab.
45 (information* adj2 need*).ti,ab.
46 (training adj2 need*).ti,ab.
47 OR/ 40-46
48 37 AND 47
49 limit 48 to (english language and yr="2006 -Current")

Appendix 2: Interview schedule for LIS staff

1. Why did you start the LIS service for biomedical researchers? How did you start working with your biomedical researchers? What do you do?
2. What services do you provide? What is the workflow and activities – what you do, what don't you do?
3. How do you support training requirements – e.g. open access, open data, license requirements, research data management, systematic reviews?
4. How do you identify your researchers' needs?
5. What is the divide between libraries or information staff and the support provided by local IT Services?
6. Who are the LIS staff? - Staff skills, background, expertise – are they librarians? What skills do you see yourselves as requiring now, what skills do you think you'll need in the future for your researchers?
7. How are you organised – what is the staff structure?
8. How are you funded? Is there special funding? Is the LIS staff time included in research bids?
9. Where are you based: are you as staff members fully embedded or partially in library/office/lab? How much time is spent in the library, can you break it down?
10. How do you monitor, report and measure impact, effectiveness?
11. How do you prioritise their activities and support?
12. How do you promote their services?
13. What are the main challenges?
14. Who else does a similar role, who else can I talk to?

Appendix 3 Information sheet/web page

(text only version of webpage)

(Introduction)

In response to the increasingly complex information needs of health care researchers, a rich and diverse spectrum of services are being offered by libraries in biomedical and translational research institutions across the world.

We are keen to explore further how our library services can be more embedded within, and better support the workflows of, Oxford's biomedical/translational research community and the central services of the BRC. The study focuses on Biomedical Research Centre funded scientists but, as well as being applicable to other biomedical researchers in Oxford, the outputs will also be of interest to the wider UK library community supporting BRCs and other centres of biomedical/translational research.

In the USA, the NIH and various other institutes have long established "informationist" (or Information Specialist in Context) programmes and posts providing research and knowledge management services in the context of biomedical research.

For example, informationists and other library professionals support researchers at CTSA-funded and other translational science institutes at each step of the research process, from grant seeking to final publication, supporting data management and preservation, providing bibliometric analysis, undertaking expert searching, and helping to ensure compliance with funder policies regarding data management and open access, as well as more bespoke services. However, the development of this kind of informationist role has been more limited to date in the UK and elsewhere in Europe.

Oxford is a world leading centre for health care and biomedical research in all its forms, from bench to bedside. Our library services work in support of NHS and MSD researchers at all levels, including the provision of many of the services outlined above and access to the largest collection of online journals and databases in UK HE.

(Aims)

Funded by the Oxford BRC and with support from external experts in information studies research, we are undertaking a range of activities between and January and July 2017 to help us identify:

- The core services that should be part of our "standard" offering to BRC funded and other researchers.
- How we can better present, and make the Oxford biomedical/health care research community more aware of, the services available.
- Gaps in current library service provision and key areas of knowledge management/information support where a more embedded information specialist could provide support to biomedical researchers and the BRC.
- The specific applicability of the "Research Informationist" role to the Oxford context and the BRC.
- The core additional skills and knowledge required of library staff to provide more embedded support to the BRC and within the wider Oxford/UK biomedical research context.

The above will be identified via a range of activities including: desk research (such as searches and analysis of the relevant literature), visits to the library services of other leading UK biomedical research centres, interviews (most likely online) with informationists and others in similar roles in the USA, and interviews and focus groups with a wide range of Oxford biomedical researchers, research nurses, and administrators.

For more information about the work of the Oxford Biomedical Research Centre, please see their [website](#).

(Contact)

Our project lead is Eli Harriss, a highly experienced information specialist based in the Old Road Campus Research Building.

If you would like to learn more about the project, or would like contribute your experience or views on how we can provide services in new ways to you and your colleagues, then we would be very pleased to hear from you.

Please email eli.harriss@bodleian.ox.ac.uk

Appendix 4 Questions for North American informationists

Reflecting on: The qualitative research on informationist roles and skills published in 2009 (Robison *et al.* Inquiring informationists, PMC 2740496) noted that researchers valued their literature retrieval skills, and the information broker/informationist as portal expertise. The main impacts were saving time, and providing training that improved practice for researchers, and (possibly) improving library usage. Researchers appreciated the informationist as a team member.

1. Looking at more recent research and evidence in the form of titles of sessions at MLA, it seems that the literature retrieval, expert searching is still valued, but extends to bibliometric and network analysis to identify potential research collaborators, systematic reviews and other types of review support. What are your views on this?
2. Training offered by informationists (and data librarians) seems to focus more and more on data management, preservation, data visualization and other types of data services? What are your views on this?
3. Bioinformationist seems a new-ish role title? What are the roles and responsibilities involved? Is the bio-informationist embedded in the research team? Special skills/training required? Can a health sciences librarian become a bio-informationist?
4. Bibliometrics seems an expanding area – what type of bibliometric skills might an informationist be required to demonstrate?
5. The impact of the informationist on saving researcher time? Is this still valued and if so, how? What are the main impacts, in your opinion?
6. The informationist as a team member... and gaining rapport with the team? What helps this process, in your opinion and/or experience? How would you advise those starting out to 'navigate the research pipeline' (as one of the MLA sessions was titled)? How would you recommend keeping tabs on researchers' information and training needs?
7. How does the relationship between the library (physical location), library website/and services offered through the website, and librarians embedded within research teams work (or not) in your opinion? What are the funding opportunities and threats?
8. In the concluding sections of the 2009 article there was this comment "The interviews revealed that many of the [informationist] roles could be played by other librarians, and others could be provided by a well-designed and carefully maintained Website." Views?

Appendix 5 Interview schedule for BRC researchers/staff

Q1. Could you give me some background to the Theme that you're working on for the Oxford BRC please?

What are the outputs that you're aiming to produce?

What are the deadlines?

Q2. Can you tell me about the different stages in the research process where you tend to need to acquire information please?

Which stages are the most information-intensive?

Where do you find the information you need (probe if necessary to find out if this includes internal/external colleagues, encourage them to give examples)?

Are there things you find frustrating about locating and acquiring the information you need?

Critical incident:

I would like to focus now on one particular occasion when you have needed to find information to support you in your work. Something that you would think of as fairly typical for the kind of information need you have in your subtheme.

I am interested in finding out about a recent incident when you were uncertain about something or needed information to complete whatever you were working on. Can you tell me as much about this incident as you can remember please –

What were you trying to do? [background – was it familiar/confusing/important/routine; what stage of research work did this situation relate to; were you working individually or with others?]

How did you deal with the situation? [who did you ask; where did you look; what resources did you think were available to you?]

Why did you choose that approach?

How challenging was the situation? [did you have any difficulties finding what you needed – time, searching, deadlines? Did you have to deal with contradictory information?]

What happened? [did you resolve situation; what helped you – advice, information, change of plan?]

What did you do with any information gathered? [will you need this information again?]

How do you feel about this experience? [resolved, waiting, fed up, no immediate resolution?]

Q3 Can you tell me about training you receive and how people in your team acquire skills please. How have you acquired skills for information management – have you received training for things like using reference management packages, finding papers, publishing your work, using research repositories, etc.?

Have you received training for data management skills (i.e. managing your research data)?

How have you found out about what resources are available to you (e.g. from the university or NHS?).

Q4. The university library and information services are changing and working more closely with researchers now. We are looking at ways to enhance our service to you.

Would it be helpful to have someone to join your team to provide support?

DISCUSS CARDS WITH POTENTIAL INFORMATIONIST ACTIVITIES AND/OR PROJECT CYCLE CARD

Would any of these be helpful to you?

Where would you normally go now for support with these activities? – does the PA play a role in this?

Q.5 Promotion and communication

How can I better communicate what we do at the library to you, and promote our services to you?
[Give an overview of what we currently do to promote services: library inductions, website, leaflets, iSkills sessions]

Appendix 6 Consent form

	
<h1>Bodleian Health Care Libraries</h1>	

Enhancing Information Support to Health and Biomedical Researchers: A Project to Support Oxford BRC Funded Researchers

Informed consent form

As a participant in this study I have read the Participant Information Sheet and have been given the opportunity to ask questions about the research. I have had more than 24 hours to consider participating in this study.

I understand that I am taking part in the study on a voluntary basis and that I am free to withdraw at any time, without giving any reason.

I understand that my interview will be recorded (either using a tape recorder or by note-taking) and accept that the results of the study will be used to produce a report for the Oxford BRC and will subsequently be used for presentation at conferences and for publications.

I understand that data relating to me will be anonymised through the use of pseudonyms and that all data including interview recordings will be stored securely.

Interviewee Informed Consent Signature:

I agree that the data I have provided may be used, on the conditions explained to me, as outlined above.

Date	
Name	
(please print)	
Signature	

Appendix 7: Services Reviewed

(Services in red excluded from final analysis)

Boston University	University of British Columbia
Case Western Reserve University	University of California, Berkeley
Columbia University	University of California, Los Angeles
Cornell University	University of California, San Diego
Duke University	University of Cambridge (BRC service)
Erasmus University Rotterdam	University of Chicago
Fudan University	University of Dundee
Harvard University	University of Edinburgh
Heidelberg University	University of Glasgow
Imperial College London (BRC Service)	University of Hong Kong
Johns Hopkins University	University of Leeds (BRC Service)
Karolinska Institute	University of Leicester (BRC Service)
King's College London (BRC Service x2)	University of Liverpool
KU Leuven	University of Manchester (BRC Service)
Kyoto University	University of Melbourne
LMU Munich	University of Michigan
McGill University	University of Minnesota
McMaster University	University of Newcastle (BRC Service)
Monash University	University of North Carolina at Chapel Hill
National University of Singapore	University of Nottingham (BRC Service)
New York University	University of Pennsylvania
NIH Library	University of Pittsburgh
Northwestern University	University of Southampton (BRC Service)
Peking University	University of Sydney
Queen Mary University of London (BRC Service)	University of Tokyo
Royal Marsden NHS Foundation Trust and the Institute of Cancer Research, London (BRC service)	University of Toronto
Seoul National University	University of Washington
Stanford University	University of Sheffield (BRC Service)
Sungkyunkwan University (SKKU)	Uppsala University
University College London (BRC service x3)	Utrecht University
University of Birmingham (UK) (BRC Service)	Washington University in St Louis
University of Bristol (BRC Service)	Yale University

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