

VIVO: a national resource discovery tool for the biomedical community

K.L. Holmes, Bioinformaticist, The Bernard Becker Medical Library, Washington University School of Medicine in St. Louis

M.R. Tennant, Assistant Director for Biomedical and Health Information Services and Bioinformatics Librarian, Health Science Center Libraries and UF Genetics Institute, University of Florida

S. Russell Gonzalez, Physical Sciences Librarian, Marston Science Library, University of Florida

V. Davis, Outreach Librarian for Agricultural Sciences, Marston Science Library, University of Florida

M.H. Devare, Bioinformatics and Life Sciences Librarian, Albert R. Mann Library, Cornell University

G.O. Hack, Assistant Director, Instruction and Information Systems, Health Science Center Libraries, University of Florida

M. Conlon, Associate Director, Clinical and Translational Science Institute, University of Florida

VIVO Collaboration

Abstract

Researchers are familiar with the leading scholars within their discipline but often face barriers preventing successful interdisciplinary collaboration and communication. This can be especially true for researchers hoping to find collaborators in the ever-evolving realm of biomedical research. One particularly urgent area is that of translational research. Translational research supports the goal of decreasing the time from bench discovery to clinical implementation. The National Institutes of Health (NIH) Roadmap for Medical Research highlights the “bench-to-bedside” approach as an integral part of the research process and emphasizes that “a stronger research infrastructure could strengthen and accelerate this critical part of the clinical research enterprise”. VIVO offers an elegant approach to addressing many of the traditional roadblocks to collaboration that often emerge in the translational research setting.

Beginning as a platform for one institution, VIVO is now an NIH-funded collaboration among seven institutions to develop a semantic web database enabling a national network of scientists. In development by Cornell University, University of Florida, and Indiana University and implemented at Ponce School of Medicine, Scripps Research Institute, Washington University in St. Louis, and Weill Cornell Medical College, each site has a local installation which will share data in flexible and openly accessible ways to a national interface, and beyond.

Libraries are responsible for providing information resources to their communities. This responsibility has changed tremendously over the last few years, moving from providing access

to books and journals toward incorporating in-depth research consultations from bioinformatics specialists and embedded clinical librarians into daily workflows. Most recently, libraries have engaged their users with innovative approaches to support translational research efforts on site; however, facilitating collaboration beyond institutional boundaries remains a challenge. VIVO offers librarians a way to transcend traditional liaison-style activities and join the rich cross-section of interdisciplinary interactions between clinicians and bench researchers in support of translational research objectives. Indeed, libraries and librarians play an integral role in the VIVO project. Librarians are charged with outreach and support of VIVO locally, including user support and training, and they also play a role in the development of local and project-wide ontological frameworks. Librarians are the perfect conduit between the VIVO platform and the biomedical research community, while VIVO allows librarians to utilize their unique skill set and knowledgebase in support of their entire research community, from bench to bedside.

This paper will describe the attributes and importance of translational science and how this NIH funded resource will support such research. We will introduce the VIVO Collaboration's structure and goals, the tasks involved in the project, and how institutions may join the VIVO community. Finally, we will discuss the vital role libraries are playing in support and dissemination of this tool on their campuses.

Introduction

Today's research labs are discovering that it is increasingly difficult to accomplish the mission of biomedical research. Gone are the days of reading a few articles each week to stay up to date in a field and there aren't many researchers these days that can definitively name the ideal collaborator for a new project. Everyone is drowning in the deluge of data, people, projects, publications, and software. The task of staying current in one's area of research is almost unheard of and the concept of branching out into a new area of investigation tends to strike terror in the heart of the most seasoned researcher. In this environment of information overload, the successful scientist needs a research discovery tool which will enable discovery of potential collaborators, opportunities for exchange and learning, and discovery of onsite facilities and opportunities which can be incorporated to help an interdisciplinary research team break through traditional discipline constraints. These overwhelming challenges underscore the role that a tool like VIVO can play to help the biomedical research enterprise work more efficiently and effectively.

The Era of Translational Research

The term "translational research" illustrates the flow of information in the academic research environment from the research bench to the hospital bed. Translational research describes the clinical implementation of bench discoveries and its overarching goal is to speed up the discovery and implementation process. There is certainly a sense of urgency with the term; indeed, Balas and Boren (2000) showed that it takes an average of 17 years for a discovery to be integrated into an accepted standard of practice. Clinical and translational research is an

approach to research that is widely accepted and is being integrated into the research enterprises at institutions worldwide to streamline the research process.

Beginning in 2006, the National Institutes of Health began to support this approach to science, launching an effort to “re-engineer the clinical research enterprise” and established the Clinical and Translational Science Awards (CTSA) Consortium. The Consortium will ultimately consist of about 60 institutions, all dedicated to clinical and translational research. The purpose of the CTSA Program is to help institutions transform their approach to science and medicine in a three-pronged manner:

1. Captivate, advance, and nurture a cadre of well-trained multi- and inter-disciplinary investigators and research teams
2. Create an incubator for innovative research tools and information technologies
3. Synergize multi-disciplinary and inter-disciplinary clinical and translational research and researchers to catalyze the application of new knowledge and techniques to clinical practice at the front lines of patient care. (<http://nihroadmap.nih.gov/clinicalresearch/overview-translational.asp>)

Translational research demands an interdisciplinary approach, in terms of topics as well as teams. Never before have we seen such a need for cooperation across subject disciplines. Today’s successful research teams often cut across diverse areas like genetics, immunology, mathematics, computer science and social work. Successful clinical and translational science research teams often include members ranging from traditional bench scientists to various clinicians, computer scientists, statisticians, nurses, nutritionists, psychologists, and librarians. Each of these individuals has a unique skill set and an important role to play that is integral to the success of the project. The varied perspectives and knowledge base of team members often enable project members to develop creative solutions and approaches. Teams comprised of diverse collaborators are often more efficient, encouraging sustained innovation and facilitating an environment of connective, synergistic thinking. (Disis, 2010) There is an overwhelming need for researchers to build these diverse teams, in terms of subject area and expertise. Unfortunately it can be impossible to identify areas of expertise on one’s own campus, let alone at a different research institution.

Sung (2003) relates that translational research can be classified into two different efforts, based upon the point of challenge in the research process, as described by the Clinical Research Roundtable at the Institute of Medicine. The first challenge (T1) involves the transfer of basic science discoveries into new therapeutic, diagnostic, and preventative applications and clinical trials of these applications in humans. The second challenge (T2) refers to the transfer of these methods into a standard practice of care. Bridging the gap between the bench, the bedside, and the community is a difficult task, compounded by the overwhelming amount of existing and new information and the difficulty of assembling the best teams to tackle T1 and T2 efforts.

Collaboration

Team science might be seen as the most obvious solution to this conundrum. Perhaps the easiest way to tear down the roadblocks that exist as research results are integrated into clinical practice is to identify the best possible members of a research team – those people who can best apply their background and expertise to the task at hand. This is an easy declaration to make, but almost impossible to execute in an efficient manner. Researchers often depend on referrals from colleagues, conversations at conferences, and the relevant journal articles to identify possible collaborators and construct productive interdisciplinary research teams. This can be a very inefficient route, as the researcher depends on ‘friend of a friend’ contacts and fate to reveal meaningful connections. Some researchers have started to use bibliographic databases as a resource for identifying potential collaborators. This approach can be successful, but because publication lags behind current work being done in a laboratory, the results can be sorely out of date. Innovative multidisciplinary research teams with the ability to identify meaningful solid information are a critical component to translating laboratory discoveries into significant clinical benefits. (Disis, 2010)

A Solution

VIVO offers a way to address many of the problems that exist in the biomedical research environment. VIVO is an open source Semantic Web application, ontology editor, and content management system that enables discovery of research across an institution. VIVO contains detailed profiles of scholars and researchers as well as events, courses, facilities, and more. The individual profiles in VIVO contain contact information, lists of publications, grants, research interests, teaching, awards, professional memberships, and other entities of interest. Data may be ingested from a variety of authoritative sources (bibliographic databases, human resources systems) and may be manually input. Individuals can edit and customize their profiles to suit their professional needs, centralizing information and providing an integrated source of data at an institutional level. Profiles can be browsed or located through a faceted search capability to enable searching in several ways and for a variety of purposes. VIVO was initially developed at Cornell University in 2003, and implemented at the University of Florida as GatorScholar in 2008. As alluded to in our 2009 DBIO Contributed Paper (Davis, 2009), a partnership was created between these two institutions and led to the development of the VIVO Collaboration, and the extension of VIVO to a national audience via a grant submitted to the National Institutes of Health in May of 2009.

(http://www.ncrr.nih.gov/the_american_recovery_and_reinvestment_act/20091102.asp)

The VIVO Collaboration

Cornell’s VIVO forms the basis of a \$12.2 million NIH grant to enable national networking of scientists. There are seven founding members of VIVO Collaboration—Cornell University, University of Florida, Weill Cornell Medical College, Indiana University, Washington University in St. Louis School of Medicine, The Scripps Research Institute, and Ponce School of Medicine. The VIVO Collaboration is comprised of specific project teams, all working in different areas. The

three most prominent teams are Development, Implementation, and Outreach, but other teams are charged with work in areas such as Ontology, Marketing and Branding, Publications and Evaluation.

The grant was awarded in fall 2009, and work thus far has focused on a number of fronts – developing the VIVO ontology, exploring means to disambiguate authors, developing the software, developing user scenarios, creating software for automatic harvesting of authoritative data (publications, grants, HR data), developing partnerships with vendors and potential application developers, presenting at national conferences, implementing the resource at the seven institutions, simplifying manual data input, developing marketing strategies and educational materials, conducting user focus groups, and planning a national conference.

How VIVO enables the research community and facilitates translational research

VIVO serves all of the major groups associated with the research enterprise. For the faculty member or research scientist, VIVO can help them find collaborators, track colleagues and competitors, keep abreast of new work in their research area and promote themselves using customizable profiles maintained via automatic and manual updates. Students can use VIVO to locate mentors, advisors, and even potential collaborators on campus. Students can take advantage of the rich search function to locate events, seminars, courses, programs, and facilities available to them at their institution. Students, like research scientists, can use VIVO as a platform to showcase their own research. Administrators are an important part of the research enterprise and are tasked with making sure that research runs smoothly at the institution. VIVO offers administrators and department heads a way to showcase programs and departmental activities as well as identify and highlight areas of institutional strength. This is particularly valuable when considering specialized centers of research and the work related to Clinical and Translational Science Award (CTSA) institutions. VIVO offers the additional benefit of allowing administrators to keep and manage institutional data in one place. Even donors and funding agencies can take advantage of VIVO's power. They can discover current funded projects, search for specialized expertise, and visualize research activity within an institution. Librarians can use the tool to understand more about campus research interests and stretch tight collection budgets to meet the most pressing research needs.

A library-based support model

VIVO enjoys a unique, but incredibly strong partner with the library. Libraries and library staff bring their expertise and areas of strength to the table to facilitate adoption, growth, and support of the platform. Libraries have long been considered neutral space on our campuses and have a rich tradition of service and support. Libraries function as an integral support component at an institution, supporting the mission and vision of the institution. Furthermore, the libraries of today are technology centers and have rich IT and data expertise that can be drawn upon for a project like VIVO.

So what does library staff actually do at institutions adopting VIVO? While specific roles and responsibilities will vary between institutions, there is a wide variety of roles that library staff can play at an installation site. One area that librarians can play a significant role in is oversight of initial content acquisition. Librarians are familiar with data content types and have experience with ontologies and controlled vocabularies. Library staff can put these skills to work during negotiations with campus data stewards for publicly visible data and later when working to ingest this data into the local VIVO installation. Librarians with a Web development background can refine the platform interface and provide feedback to the national development team.

Some of the most important roles in support of the project play into established areas of strength and extend the traditional library liaison role. For example, librarians can facilitate buy in, adoption, and use at an institution by engaging potential users through presentations, demonstrations and promotional materials; by developing user scenarios relevant to researchers and administration; by creating a community of support via user forums; and by performing usability studies, focus groups, and other means to detect user needs and perceptions and feed these results back to the development team. Moreover, librarians can facilitate local support and training by providing instruction on topics such as how to search the system and edit their individual profiles, by modifying documentation for local needs, by providing trouble-shooting and help-desk support, and by creating videos, tutorials, web site FAQs, and other resources to support the use of the VIVO discovery platform.

Librarians and library staff are important components of the library-based support model. Library staff have skills and expertise in information organization, instruction, usability, and subject expertise. Librarians understand the information needs of their clients and enjoy close relationships with them in their everyday work. Library staff play integral roles in support of the research enterprise and thus, have an enhanced understanding of their institutions and the research, education and clinical efforts and priorities of the institution. Perhaps most importantly, librarians understand the importance of collaboration and know how to bring people together.

A vision for the future

As VIVO is implemented at a growing number of institutions, the rich data available to the network will continue to grow as well. The national network is expected to grow organically as the word spreads about the VIVO platform and institutions and organizations understand the role VIVO can play in their research enterprises. While the NIH-sponsored funding opportunity only covers the seven institutions outlined in the grant, dozens of institutions, societies, research groups and agencies are downloading the open source VIVO code and are beginning to work internally with the platform using their own data to learn how VIVO can be implemented onsite as a robust research discovery tool. It is also expected that as VIVO is adopted nationally, additional uses will be proposed and will require the development of new applications. These applications need not be created by the current VIVO Collaboration

members – as the resource is completely open source, the only limit to new application creation is the imagination of developers. To learn more about VIVO, please visit <http://vivoweb.org>.

The first national VIVO conference will be held August 12-13, 2010 at the New York Hall of Science. The conference will bring together members of the VIVO Collaboration and representatives from potential adopting institutions, vendors, application developers and others interested in VIVO implementation and development. Workshops, panel discussions, presentations, posters and time for networking have all been built into the schedule, creating an environment conducive to learning and collaboration. Information on abstract submission and conference registration is available at <http://vivoweb.org/conference>.

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