



Peer-Reviewed Article

The Scientific Communication Initiative at a Medical Military Library

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ABSTRACT

Implementation of new scholarly communication library service in the digital age is characterized by the competitive forces between the old library information services and the ambiguity of future information services. This research analyzes the development process of scientific initiative and collaborative partnership in the military medical library environment aimed to enhance the quality of scientific communication and information skills in military residents and clinicians. The environmental analysis was conducted to determine the scholarly communication needs in the scholarly military medical environment. The ambassador-based model was used for the development of scientific communication initiative (SCI) at the military medical library. The SCI consisted of two components: library information communication and scientific communication. This implementation in the military medical environment enhanced scholarly communication, research skills development, and information education.

KEYWORDS

Scholarly communication; library liaisons; scientific initiative; library collaboration

SUGGESTED CITATION

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Introduction

Scholarly Communication and Library Services

A scholarly communication system is a complex structure of information production and distribution that uses various communication methods to link scholars both globally and within countries (English & Dancik, 2019). In the current digital age, a significant shift has occurred that requires a reshaping of scholarly communication, including distinct various economic, political, and sociological elements (English & Dancik, 2019; Iyengar & Massey, 2019). The Scholarly Publishing and Academic Resources Coalition (SPARC) and Association of College and Research Libraries (ACRL) prioritize education, advocacy, and coalition-building within the higher education community and urge research to mitigate growing concerns around scholarly research, the publishing enterprise (English & Dancik, 2019), and the utilization of Information Communication Technologies (ICTs) for scholarly communication (Sawant, 2012). This system includes features and issues associated with publisher monopoly, legal aspects, and the politics of fair use, intellectual property, tenure, and promotion in higher education (English & Dancik, 2019).

The concept of scholarship is inextricably intertwined with scholarly communication and publication. Borgman (1990, pp. 13-14) characterized scholarship as “inherently a social process” where “research in all fields is incomplete until validated through review processes and shared with others.” Halliday (2001) defined scholarly publication as the process of creation, dissemination, and preservation of scientific knowledge by attributing essential criteria such as trustworthiness, public accessibility, and availability. Scientific content, study results, and research outcomes generated in the process are distributed by researchers within scholarly communities utilizing informal networks, initial public distributions (e.g., conference, preprints), and formal publications in peer-reviewed journals (Halliday, 2001).

Library materials and services as well as librarians bridge practice-based lifelong learning and scholarly communication. Proficiency in the analysis and synthesis of published literature, critical appraisal skills, and research information skills are essential for graduate medical education. Moreover, user-centered information services, liaisons with highly competent librarians in research libraries (Jaguszewski & Williams, 2013; Tennant et al., 2001; Tmanova et al., 2014), and librarians integrated with medical research teams enhance the value of the military academic library (Johnson et al., 2017).

An analysis of barriers observed in the development of information services in the military medical setting can provide military librarians and leaders with valuable information for initiating a scientific initiative in library. This research explores the development of scientific initiative as well as internal and external forces and facilitators useful in the creation of information initiatives in the military medical environment. The objective of this study is to build a Scientific Communication Initiative and collaborative partnerships in the military

medical center to enhance the quality of scientific communication and information research skills in residents and clinicians.

Military Library

Darnall Medical Library (DML) is a small federal medical library that provides innovative services to improve the quality of healthcare and education. It was established in 2012 to support the Walter Reed National Military Medical Center (WRNMMC) biomedical community by providing quality information and services to support medical readiness and care for members of the Uniformed Services and their families. WRNMMC is also a site for military graduate medical education (GME) training of future healthcare providers who care for military personnel and their families. WRNMMC GME is comprised of approximately 75 medical and allied health programs. It strives for educational excellence, ethical values, high healthcare standards, and a scholarly environment as the driving forces of successful military medical graduate education. The professional development and scholarly communication of residents and clinicians continue through the GME and clinical practices. Residents must demonstrate success in science and scholarly activity for which information literacy, research, and scholarly communication skills are essential. Therefore, library and scholarly communication support is fundamental for GME faculty and residents to conduct research and publication.

Scientific Communication Initiative

In 2015, the library reached out to WRNMMC's Directorate of Education, Training, and Research (DETR) and Department of Research Programs (DRP) to support initiatives in developing scholarly communication and education services. There were no prior research information services available at DML. The Scientific Communication Initiative (SCI) was then designed to help WRNMMC researchers navigate the information ecosystem and integrate information into medicine and the GME residency program to accelerate research and scientific education.

Methods

In 2015 an environmental scan was performed to determine the scholarly communication needs at the military medical center. Unstructured interviews were conducted with representatives of various departments to determine the needs and shortcomings of the scholarly communication and research skill set of residents and clinicians. In addition, unstructured observations were conducted for GME didactic instructions, research presentations, the journal club, and clinical and research meetings to identify the informational, educational, and research needs and to evaluate the state of scholarly communication published by military medical center authors.

In 2016 and 2017, a research quality analysis was conducted to investigate the state of scholarly communication at the medical center (2012–2017) and assess the research impact of literature (2012–2018) published by researchers in the Department of Medicine and two GME programs. The Accreditation Council for Graduate Medical Education's (ACGME) common

program (residency) requirements (ACGME, 2015) in Radiology, Radiation Oncology, Endocrinology, Psychiatry, Pathology, Cardiology, Internal Medicine, and Allergy/Immunology training programs were examined to identify potential information literacy gaps. These findings were then applied to develop the SCI. Also, a pilot study to develop information instruction and an information curriculum in radiology was undertaken at two GME Residency programs.

An ambassador model was used to foster the development of collaborative scientific partnerships among the key constituencies, promote the library's research resources and services, and provide support in research, scholarly communication, and ICT application (Tmanova et al., 2014). The ambassador model is based on formal communication (documents, meetings, lectures) to communicate with departments to promote collaboration in scholarly communication and the development of information liaisons. It was also used to develop a new library service, namely, the SCI, at the military medical center. The Ambassador model used in this study distinguishes from the marketing approaches of brand ambassador and brand ambassador term for the development of library services.

The SCI key constituencies were researchers, medical center clinicians, educators, and Uniformed Services University Health Sciences (USUHS), residents, fellows, clinicians, and medical students (Table 1).

Table 1

Scientific Communication Initiative (SCI) Constituencies

Subject-specific Initiatives	Constituencies
Research	Researchers (DRP, Murtha Cancer Center, Epidemiology Cancer Center, Department of Medicine, NICoE)
Clinical care	Clinicians Department of Medicine, Department of Radiology and Radiological Sciences, NICoE
Education	Residents, fellows, students, clinicians (GME, DRP, U.S. Army BBF, USUHS)

Results

DML's alliance with the WRNMMC GME directorate led to the development of a strategic plan to enhance scholarly communication in residency programs and information collaboration with research librarians. Specifically, the plan was designed to integrate innovative information, scholarly communication services, scientific information library guides, and instruction in GME to accelerate research and scholarly communication (Tables 2, 3, and 4). In

addition, the library's information communication (IC) initiative and SCI were created to integrate strategic information and knowledge elements. The set of selected resources and tools and designed services were implemented for both the IC and SCI components (Table 2). Collaboration, liaison, and education were also added to the SCI (Table 2, 4, 7, 8).

Table 2*SCI Structure*

Scientific Communication Initiative	
Library Information Communication	
Resources and Tools	Services
Resources <ul style="list-style-type: none"> • Library guides: • Scientific Initiative • Systematic Review • Research Quality • Ethics in Medicine & Research • Scientific Information • Blog: • Information and Knowledge Tools <ul style="list-style-type: none"> • Libguides content management systems (CMS) 	<ul style="list-style-type: none"> • Journal Selection • Education Outreach <ul style="list-style-type: none"> • Library orientation • Library presentations • Lightning talks • Flyers
Scientific Communication	
Resources and Tools	Services
Resources <ul style="list-style-type: none"> • Library Guides • DTIC PubDefense • DoD Grant Awards • DoD Techipedia Tools <ul style="list-style-type: none"> • MilSuite • DoDTechSpace • Intranet collaborative tools • Digital Science tools • Open-source tools (Sci2, Gephi, IN-SPIRE, R) 	<ul style="list-style-type: none"> • Science Wise • Literature informatics • Scientific writing • Publication • Consultations • Systematic review • Research quality analysis • Education Outreach <ul style="list-style-type: none"> • GMEC • Grand Rounds • GME programs
Collaboration	Liaison
<ul style="list-style-type: none"> • Systematic review collaboration • Educational research collaboration • Project-specific collaboration 	<ul style="list-style-type: none"> • GME programs: Information & education liaison (research, clinical practice, education)

- MS degree program: Education liaison (research, education)
- Department: Information liaison (research, clinical practice, education)

Education

- Instruction – information lectures
 - CME, CE – scientific writing and communication, scholarly communication
-

Table 3

SCI Services and Service Structure

Literature Search, Analysis, and Synthesis

Goal: Help to navigate the research information ecosystem for research question and study hypothesis development

Action: Guide for the exploration of multidisciplinary literature for the scientific discovery and information synthesis to enhance scientific inquiry and accelerate scientific discovery.

Model: Information Expert

- Literature search strategy design
- Literature analysis & synthesis
- Information & citation management

Lecture

- Research question for scientific study
- Literature review
- Literature informatics
- Literature searching: Web of Science
- Citation management

Consultation:

- Designing a literature search
- Conduction a literature review
- Citation management

Conducting Research

Aim: Enhance application of bioethics to clinical medicine and research, clinical, and healthcare decision making.

Goal: Exploration, selection, and recommendation of bioethics scientific publications for integration into the medical education, and clinical practice to improve clinical care and education.

Information Resources

- Library guide
- Research ethics
- Bioethics
- Planning research
- Study design
- Data analysis
- Funding
- Education

Consultation:

- Bioethics in conducting research and medical practice
 - Ethics of scientific communication
-

Scientific Writing

Aim: Enhance scientific communication through an effective scientific writing, publication, and professional speaking.
Approach: Guide for the exploration of multidisciplinary literature, information analysis, critical appraisal, and scientific writing to enhance the scientific publication.

Model:

- Literature informatics
- Information management
- Scientific writing
- Scientific writing consultation
- Scientific communication lectures

Lecture

- Literature review
- Scientific writing
- Scholarly publication

Consultation

- Literature review
- Scientific Writing
- Scholarly Publication
- Writing guidelines

Conducting Systematic Review Collaboration

Mission: Enhance the quality of systematic reviews and clinical care.
Approach: DML offers an information solution & expertise, and collaboration in conducting a systematic review.

Model: Information collaboration team.

Collaboration Team

- Clinician-Librarian

Information Resources

- Library guide

Lecture

- Conducting a systematic review
- Research question for scientific study
- Research protocol development

Consultation

- Systematic review collaboration
- Conducting a systematic review
- Systematic review data management
- Article publication
- Data analysis
- Data communication

Research Quality Analysis

Aim: Evaluate the value of scientific medical research and research impact of clinical research to enhance scientific discovery in healthcare.

Approach: Guide in conducting analysis of scholarly publication to determine the value of scholarly research and enhance the quality of scientific inquiry, education, and publication.

Data Management

DoD Data Management

Lecture

- Research data management
-

<ul style="list-style-type: none"> • Writing DoD data management plan for grants • Data communication 	<p>Consultation</p> <ul style="list-style-type: none"> • Data management plan for DoD grant • Research data management
Publication	
<p>Aim: Improve article publication and ethics of academic publication.</p> <p>Goal: Enhance the understanding of ethical principles of communicating clinical research, academic publication ethics, intellectual property, and copyright.</p>	<p>Information Resources</p> <ul style="list-style-type: none"> • Library guide • Academic publication • Plagiarism • Education <p>Consultation:</p> <ul style="list-style-type: none"> • Article publication • Data communication

Table 4*Information Lectures*

Lectures	Content
Conducting Research	This lecture introduces the process of conducting research, development of the research question and hypothesis, literature analysis, research methods, data management, and research integrity.
Ethics in Academic Writing and Publication	This lecture introduces the standards and guidelines of ethical writing, research theft and predatory publishing, plagiarism, research integrity in writing and communicating research and research data, copyright and intellectual property rights, research integrity, and research forensics used for the detection of plagiarism.
Writing Academic Article	This lecture is an introduction to the writing an academic article, submission and review, authorship guidelines, copyright and intellectual property rights, research integrity, and ethics of publication.
Scientific Communication	This lecture is an introduction to the development of a scientific presentation for communication of scholarly research.
Citation Management	This lecture introduces the fundamentals of citation management.

Research Data Management	This lecture introduces a concept of data-driven research, research data management, data management planning for grant proposals, and DoD biomedical research and data policy.
Writing a Systematic Review	This lecture provides an overview of the purpose, structure, components, writing process of systematic review, and systematic review standards and guidelines.
Research Question for Scientific Study	This lecture introduces the process of research question development and planning the literature analysis for scientific studies.
Systematic Review Protocol	This lecture introduces the concepts of protocol development for a systematic review, protocol registration with Cochrane and PROSPERO, and standards and guidelines for writing a systematic review.
Literature Search: Web of Science	This lecture introduces literature searching strategies for the exploration of published literature using Web of Science databases for the development of the scientific study.
Literature Informatics	This lecture introduces the analysis of multidisciplinary literature, information management, and information synthesis for the development of research studies.
Literature Review	This lecture is introduction to principles and methodology for conduction of literature review, analysis of literature, planning literature review, research development, literature analysis and synthesis, and writing literature review draft.

Medical Library IC Initiative

Resources and Tools

A Scientific Initiative library guide, which included a subset of topical guides (Table 5) was developed and distributed to the WRNMMC biomedical community and liaison departments to facilitate research inquiry, study development, and scientific discovery access to library information resources. Topic-specific guides for areas such as Scientific Writing, Systematic Review, Data Management, Research Quality Analysis, Literature Informatics, and Ethics in Medicine and Research included the library's open-source resources and concise descriptions of the research process, research ethics, systematic review process, scientific writing, and research quality analysis (Table 5). The library guide for Ethics in Medicine and Research was developed to integrate the ethical principles of research into GME programs, curriculum development, and didactical lectures to encourage the discussion of research ethics, integrity, and the researcher's responsibility in studies involving human subjects and clinical

care provision. Other library guides were created to point residents toward specialized resources in Radiation Oncology, diagnostic radiology, transfusion medicine, and mental health (Table 5).

Table 5

DML SCI and Subject-Specialty Library Guides

Library Guide	Content
Scientific Initiative	<ul style="list-style-type: none"> • Conducting research guide: information resources on bioethics and ethical conduction of research in biomedical sciences • Literature informatics guide: starting information to explore multidisciplinary literature for the scientific discovery and information synthesis to enhance a scientific inquiry and accelerate scientific discoveries. • Information management guide: subset of the Literature informatics guide that lists starting information resources and tools for analysis and critical appraisal of information resources to enhance a scientific inquiry and accelerate scientific discoveries. • Scientific writing guide: starting information to enhance scientific writing, publication, and professional speaking. • Publication guide: the standards and guidelines of academic ethics, plagiarism, research integrity, open access publication, copyright and intellectual property rights, and academic publication.
Systematic Review	Information resources on conducting systematic review and collaborating with librarians on conducting a systematic review.
Research Quality Analysis	Information resources on scholarly publication metrics, research quality methodology, and research quality analysis.
Ethics in Medicine and Research	Information resources on ethics and ethical principle of research conduction for integration in medical education programs, curriculum, and didactics lectures

Scientific Information	Information resources on COVID published in journals, associations, the National Library of Medicine, search engines, guidelines, datasets, clinical trials, and global science leading agencies and associations.
Transfusion Medicine	Selected information resources (books, journals, databases, applications, and didactics)
Radiology	Selected information resources (books, journals, databases, applications, and didactics)
National Interepid Center of Excellence (NICoE)	Selected information resources on traumatic brain injury (TBI), post-traumatic stress disorder (PTSD), and mental health for NICoE.

Also, within the initiative, the LibGuides content management system was used to enhance access to information resources. Specifically, LibGuide channeled specialized information resources useful for exploring library collections, clinical specialty publications, DoD Department of Technical Information Center resources, data sets, Open Access publications, and other relevant resources. The communication process of information resources included selecting, evaluating, and distributing specialized resources to library users through quarterly flyers, lightening talks, and library orientation presentations.

Initiatives

A journal selection initiative was initiated to increase the number of scholarly articles. The service included selecting and evaluating journal selection databases and identifying the journal selection criteria most helpful in the decision-making process. Subject-specific databases were recommended to select journals that matched submitted criteria, journal information (e.g., journal IF, scope, rejection, submission timeline), and journal guidelines for authors. Also, guidance and instruction on ethical considerations in research, plagiarism, intellectual property, and copyright were provided to authors, and a journal selection request template was created. After the service was initiated, there were 67 submissions for journal selections.

Education

Lightning talks on scholarly communication and library resources were delivered during research and clinical department meetings. The informationist collaborated with the DRP education team to deliver information on research methods (DOM, 2017).

Medical Library Scientific Communication Initiative (SCI)

Resources and Tools

Various digital tools were integrated into courses offered by the library and information lectures taught as a part of GME didactics. For instance, literature search databases were presented, including open-source literature search engines to increase access to multidisciplinary and interdisciplinary resources. Also, DTIC, and open-source tools were utilized in training, consultations, and collaboration (see Table 2).

Initiatives

An initial analysis of scholarly communication at WRNMMC and the library's scholarly communication initiative was presented to DRP in a 2016 research meeting. To offer the information to the biomedical community, an informationist and the DRP Research Education Services team reached out to the GME program directors and Department of Medicine chief to arrange the abovementioned 22 outreach educational talks in 2017 (DOM, 2017). The initiative to promote scientific communication was supported by the WRNMMC command and led to a "Publish, Do not Perish" Grand Round for WRNMMC hospital clinicians, researchers, and residents. Grand Rounds are formal meetings (didactics, seminars, conferences) of medical education on clinical care management and distribution of new research information to enhance clinical practice (Sandal et al., 2013). Editors from three leading journals provided guidance, advice, and insights for successful publication in biomedical journals. This was the first event that extended the library's role in developing information services to enhance research and academic publications.

Moreover, a scientific writing clinic was initiated to encourage the publication of scholarly works. Consultation services were provided on academic article standards and guidelines, conducting research, carrying out a literature search, journal selection, intellectual property and copyright, research integrity, DoD and DTIC publication guidelines and standards, Open Access publication identifying predatory journals, and publication ethics. Most often, the questions raised in consultations concerned literature search strategies, intellectual property rights and copyright, and journal selection and publication.

The informationist also provided expertise in literature search strategies and recommendations for writing clinical guidelines and grants or conducting specialized projects. This included literature search and synthesis, hypothesis-driven literature search, information management, and information support to the military task force. These services resulted in the publication of one clinical guideline, several grant awards, and a project grounded in basic and clinical science to accelerate cancer research. Another example of collaborative engagement was

assistance with literature searches and information management for the cancer protocol writing teams.

In addition to these initiatives, Science Wise is a multidisciplinary information advisory created to improve residents' skills in subject-specific literature analysis and scholarly publication (Table 6). Consultations are offered on developing research studies, analyzing literature, writing literature reviews, conducting systematic reviews, data management best practices, research ethics, bioinformatics, and informatics. There were few consultations and literature searches in bioinformatics. Literature review consultations were initiated to assist residents in study development and residency projects. The consultations consisted of guidance for literature searches, analysis of main ideas, identification, and discussion of gaps in the field, and evaluation of the research contributions of the study topic. Literature review planning, literature analysis and synthesis, research development, and writing a literature review were also discussed.

Table 6

Science Wise – Information Consultation Service

<i>Scholarly Communication</i>	<i>Bioinformatics</i>	<i>Health Informatics</i>
<ul style="list-style-type: none"> • Literature Informatics <ul style="list-style-type: none"> • Search Strategy Design • Literature Synthesis • Data Management • Data Communication • Scientific Writing & Communication <ul style="list-style-type: none"> • Writing academic articles, literature reviews, systematic reviews • Standards & guidelines for conducting & communicating research • Journal selection for publication • Ethics of Scientific Publication 	<ul style="list-style-type: none"> • Sequence Analysis (BLAST, conserved domain, multiple sequence alignment) • Gene Expression Analysis (Gene, MedGen, GTR, Gene, dbGaP, RefSeqGene) • Chemicals & Bioassays (BioSystems, PubChem Compound, PubChem Substance) 	<ul style="list-style-type: none"> • Data governance • Health Information Management • Health Information Technology • Healthcare Ethics • Information Privacy • Intellectual Property • Health Cybersecurity

The Research Data Management Initiative is presently in the development phase and comprises educational lectures on data-driven research and best data management practices. Educational lectures are integrated into GME didactics and library lectures (Tables 3, 4).

Furthermore, a systematic review collaboration initiative (Table 7) was developed. An educational library guide was designed to outline the systematic review process, systematic review methods, standards, methodology, and library resources. Lectures and individual consultations were offered on how to write a systematic review, draft research questions, and develop a research protocol.

Table 7

Systematic Review Collaboration Requirements and Expectations from Collaboration in Conducting Systematic Review

Systematic Review Collaboration Team	
Systematic Review Coordinator	Medical Librarian - Clinician
<ul style="list-style-type: none"> • Describe the goal of S.R. and S.R. process to clinician. • Describe S.R. standards and guidelines to clinician. • Outline the approximate timeline of the entire review process to clinician. • Outline the librarian's timeline for initial search and subsequent search to clinician. • Outline the librarian's role and negotiate authorship to clinician. • Assign the collaborating librarian. • Describe the role of librarian in collaboration for conducting systematic review to clinician. <p>S.R. collaboration requirements:</p> <ul style="list-style-type: none"> • Systematic Review Protocol • Systematic Review Collaboration request from the lead S.R. author <p>Other S.R. collaboration requirements:</p> <ul style="list-style-type: none"> • S.R. collaboration requestor is WRNMMC clinician 	<ul style="list-style-type: none"> • Preliminary Literature Search Meeting: Librarian and Clinician <ul style="list-style-type: none"> • Discuss research key terms, concepts, and research question/hypothesis. • Solicit the researcher's input on specific keywords, terms, controlled vocabulary, abbreviations, etc. • Discuss additional keywords, terms, and concepts to be included in the search strategy. • Discuss search limits (publication year, age, gender, etc.) for the major search. • Preliminary Search Results Discussion: Librarian and Clinician <ul style="list-style-type: none"> • Deliver the preliminary search results from OVID Medline or PubMed using bibliographic software. • Verify included key terms, concepts, and research question/hypothesis and their representation in databases. • Inquire if additional keywords, terms, controlled vocabulary, abbreviations, etc. should be included. • Finalize all details before running the search in multiple databases. <p>Major Final Search: Librarian Adapt search strategy to search databases.</p> <ul style="list-style-type: none"> • Perform searches in multiple databases. • Combine results and remove duplicates. • Deliver results via citation management tool. • Review results via email or in-person with the researcher.

- S.R. collaboration authors remain stationed at WRNMMC for three years (minimum)
 - S.R. team consists of two subject-specialists (minimum)
 - Librarian co-authorship of S.R. article
 - The International Committee of Medical Journal Editors (ICMJE) recommends determination of the authorship using criteria
 - Substantial contributions to the conception and design, acquisition, analysis, and interpretation of data.
 - Drafting and revising critically for significant intellectual content.
 - Approve the final version for publication.
 - Accept accountability addressing and resolving any issues about the integrity of the research study.
- Final Systematic Review Steps
 - Update search and deliver results before publication submission. Review results via email or in person with the clinician.
 - Write search methodology according to the journal standards and guidelines. Review section via email or in-person with the clinician.
 - Submit search methodology, raw search strategy, and flow diagram to researcher for inclusion in journal. Review sections via email or in-person with the clinician.
 - Provide librarian's credentials for inclusion in journal.
 - Request the systematic review article to review the written article
 - Provide comments on written article
 - Communicate with clinician on article publication.

The Research Quality Analysis (RQA) Initiative was piloted in the medical center to analyze publications by medical center researchers (see Table 3). An analysis of articles published by the Department of Medicine was conducted in 2016 and 2017, and the two reports led to the establishment of the Annual Report of the Department of Medicine. An analysis of published literature was conducted for the gastroenterology research group to assess faculty and residents' scholarly publications, and the report was submitted to the gastroenterology department chief.

The informationist developed a concise protocol for implementing the RQA service to assess published research. As a result of the pilot RQA initiative, analytical software for conducting research quality analysis was selected and approved by DISA. RQA was piloted in two graduate medical programs (Radiation Oncology and radiology) to analyze publications produced by the programs in 2019. As a result of the pilot program, a strategic plan was developed to establish the RQA service in the medical center to enhance research and education and assess the health impact of published literature. The RQA protocol integrated RQA into GME programs and assisted GME program directors with study development, mentorship, and education.

Education

Lectures in 13 GME didactics were conducted to encourage research, literature analysis, academic writing, information management, ethical research, scholarly publication, and information research skills in residents and clinicians (see Table 4). The topics included research, writing academic articles, research data management, scientific communication, literature informatics, and information management. The lectures were offered through the library course program and GME curriculum. Information lectures were also integrated into the liaison departments. For instance, four lectures (literature informatics, academic article writing, scientific communication, and research data management) were added to the BBF curriculum and two lectures (literature informatics in radiology, scientific writing & communication) were introduced into GME in the Diagnostic Radiology curriculum. Additional instruction was included in the journal club in Radiology as well as guest lectures for GME programs, clinical departments, and USUHS. Also, guest lectures in scientific communication were taught to USUHS medical students and faculty.

Collaboration

Collaborative and cooperative partnerships in education, research, and clinical practice were developed with GME and the scientific community (see Tables 1 and 2). These partnerships drew on four concepts: a) information instruction and mentoring enhance residents' information literacy, research skills, learning, and teaching efficacy; b) library guides, which consist of interdisciplinary and multidisciplinary information resources and core references, increase the utilization of information resources; c) integration of ICTs enhances the channeling of subject-specific information to information users; and d) librarians' information expertise increases the quality of research and scholarly communication (see Table 3).

Systematic review collaboration. The systematic review collaboration service (see Table 7) was developed in 2015 to enhance clinical practice, the analysis of published literature, and the quality of publications by establishing collaboration among librarians and clinicians. The service also offered consultations and lectures on conducting systematic review, requirements, protocol, and research question development. Because this was a new initiative, a library guide and lectures were provided to educate clinicians on the standards, principles, methods, and process of systematic reviews of published literature. For instance, lectures on Systematic Review, Research Questions for a Scientific Study, and Systematic Review Protocol were offered through library courses, and guest lectures on similar topics were given through the GME program and clinical departments.

The DML systematic review collaboration team consisted of three medical librarians and a systematic review coordinator. All medical librarians were formally trained in methods for carrying out systematic reviews. The systematic review coordinator oversaw the collaboration

between clinicians and librarians, management of systematic reviews in the library, and educational instruction. DML contributed to three peer-reviewed published systematic reviews, two conference presentations, and four registered systematic review protocols conducted in collaboration with medical center clinicians as first authors. A bibliometric analysis conducted on published systematic reviews at the medical center prior to the establishment of the DML systematic review service ranked authorship from third to seventh in terms of collaboration with clinicians from other medical centers.

Educational research collaboration. Collaboration with GME program directors and department chiefs provided librarians with an opportunity to learn the goals of the educational programs and to develop the curriculum to guide research development. As a result, an educational collaboration was established to study ways of improving research proficiency and scholarly publications by residents and fellows. The research study was approved by the medical center's institutional review board (IRB). It is ongoing, and the preliminary results of the pilot study are in submission for journal publication.

The integration of information lectures (see Tables 3 and 4) in GME residency programs and educational liaison with GME programs enhanced the research skills of residents and Master's students, leading to quality clinical practices and graduate thesis projects.

Collaboration with program enables librarians to contribute to the development of an information skill set and competencies in military medical residents and Master's students in Health Services. Integration of the LibGuides Learning Tools Interoperability into the military Sakai learning management systems was discussed with the leadership to provide information assistance, reference consultation, and instruction integration (Davis, 2017; Lee, Lowe, McDonald, & Meiman, 2017).

Project-specific collaboration. Project-specific collaboration in literature analysis was initiated with the Murtha Cancer Center and Division of Epidemiology and Biostatistics. A systematic approach was used to develop search strategies to explore basic science translation in clinical practice in cancer research. Analysis of the literature in various biomedical databases revealed 53 EndNote libraries containing published articles on cancer sites. These results were delivered to the research team to analyze the literature and conduct a literature synthesis. A collaborative partnership was developed with researchers in grant writing to assist with literature searches, information management, and scholarly communication. This project-specific collaboration resulted in grant awards where information resources were critical to research studies and grant writing success.

Liaison

Information and educational liaison: GME (research, clinical practice, and education). An information liaison collaboration was developed with GME programs in Radiology and Radiation Oncology to facilitate collaboration between the library and GME to

support their education, research, and clinical care mission. The research portion included the areas of information collaboration, research assistance, education, RQA, graduate medical education information resources, and information services to the GME program (Table 8, Fig. 1). The DML portion provided support to GME programs in radiology and radiation oncology research and scholarly communication services, systematic review collaboration, academic article writing, research data management, bibliometric analysis of scholarly publications, information instruction, and subject-specialty specific information support in research projects.

Table 8

Library Information Liaison to GME in Diagnostic Radiology and Radiation Oncology Residency Programs (2017-2018)

Subject-specific liaison	Description
Information	<ul style="list-style-type: none"> • Communicate with educational coordinators to identify information and research needs to develop information resources and educational instructions to support the educational mission. • Inform educational coordinators and residents about the new library resources and services. • Advise on subject-specific information resources. • Develop library guide of subject-specialty information resources.
Scholarly Communication	<ul style="list-style-type: none"> • Conduct literature analysis of published research on subject-specific topics, studies, and grants. • Collaborate on writing a systematic review, meta-analysis, review, case study, and other scholarly articles. • Teach information lectures on information processing, synthesis, and management. • Consult on biomedical data discovery, visualization, and management. • Advice on DoD requirements on scholarly publication and data management planning for grants. • Advice on principles, guidelines, and ethics of scholarly publication in biomedical journals and DTIC.
Education	<ul style="list-style-type: none"> • Assist educational coordinators with development of discipline specific educational resources. • Help with GME course design and selection of educational material for courses. • Advise on use of learning technologies for course teaching. • Collaborate with educational coordinators on development of research curriculum, courses, and educational research.

	<ul style="list-style-type: none"> • Integrate selected information lectures in graduate education curriculum. • Collaborate with educational coordinators on the development of research skills in residents. • Teach information lectures to residents. • Offer information research consultation and training.
Research Quality Analysis	<ul style="list-style-type: none"> • Analyze the research impact and publication trend of GME program scholarly publications. • Conduct the research quality analysis of scholarly publication in specialty.
GME Information	<ul style="list-style-type: none"> • Evaluate information resources used in GME program.
Resources Development	<ul style="list-style-type: none"> • Evaluate selected resources and recommend for acquisition. • Conduct analysis of emerging information resources associated with GME program.
Information Service to GME Residents	<ul style="list-style-type: none"> • Inform residents on new information resources associated with a subject specialty. • Help residents with the conduction of literature searches for grant and research study. • Provide guidance with academic publication. • Educate on ethical conduction and publication of research. • Offer literature search consultations. • Offer information lectures.

In addition to the library's information collaboration service to GME programs in radiology and radiological sciences, the Research Information Center, morning clinical research meetings, and research meetings were used to support the clinical and research mission of the GME program in diagnostics radiology and radiation oncology (Fig. 1). Morning clinical research meetings were held to integrate research information services and enhance evidence-based medicine (EBM) in clinical practice.

Figure 1

Structure of the Research Information Center in the Radiation Oncology GME Program (2017-2018) Using the Collaborative Tools



Information assistance in literature searches and analyses of biomedical journal articles enhanced clinical care and clinical decisions in times of information uncertainty to develop the optimal clinical approach or clinical question. To increase information access, a built-in private network Information Center was developed using a collaborative platform accessible to authorized users to streamline information resources (Figure 1). Clinical information questions were researched within one week or according to an established timeline relevant to clinical care and uploaded to the Information Center. Information assistance was also provided to residents and clinicians for their research projects and literature analysis. Private collaborative network tools enhanced access to information resources specific to clinical, research, and patient care quality for residents.

Educational liaison: US Army Blood Bank Fellowship (BBF) (research and education). The education liaison was developed with the U.S. Army BBF program in 2016. This program adapted the educational model where an informationist serves as an instructor, consultant, and information mentor (Tmanova et al., 2015) to M.S. in Health Science graduate students. The educational team consisted of the program director, research coordinator, and informationist. Four information lectures were integrated into the M.S. graduate curriculum.

Office hours were held weekly to help M.S. students with their course, laboratory, and thesis. The classes consisted of an average of 5–8 students, as small classes are useful for designing information literacy and research skill development instruction to meet the program objectives. This collaboration with the U.S. Army BBF program resulted in the successful

completion of student theses by U.S. Army laboratory officers of the classes of 2017, 2018, 2019, 2020.

Information liaison: National Intrepid Center of Excellence (NICoE) (research, clinical practice, and education). The collaborative information liaison was established with NICoE researchers and clinicians to support their information needs to advance diagnosis and care for patients with traumatic brain injury or psychological health conditions. Currently, the information collaboration with research and clinical groups is being expanded by developing specialty information resources, analyzing the published literature, and information literacy education. The liaison is in development and will likely evolve with the establishment of collaborative relationships.

Ambassador Model in Library. The ambassador model bridges the library with the scientific community through an experienced librarian and scholarly communication support team (Tmanova et al., 2014). This collaboration fosters scientific partnerships among key constituencies, promotes the library's research resources and services, and provides support in research, scholarly communication, and ICT (Tmanova et al., 2014). GME in the military medical environment happens in a clinical setting. Implementing new information initiatives requires a set of forces and facilitators of change in leadership, organizational culture, and informational change drivers in a complex system (Latham, 2013a, 2013b). The ambassador model promotes the library through collaborative partnerships among the key constituencies by providing research, scholarly communication, and ICT support to the biomedical community (DOM, 2017; Tmanova et al., 2014). The leadership, approaches, culture, and analysis of tension and resistance (Latham, 2013a, 2013b) in the military medical environment provide insights into barriers to initiation of scientific communication services in military medical centers and academic medical colleges.

Use of the ambassador model for services at academic library S.J. Wood Library and C.V. Starr Biomedical Information Center at Weill Cornell Medicine college resulted in the development of a translational science liaison to support the research of multiple and diverse scientific communities (ITS, 2014). The ambassador model was effective for developing research support for clinical and translational scientists, designing subject-specialty information instruction in health sciences, and establishing guidelines for a collaborative research partnership among basic science researchers, clinicians, and community members.

For example, translational science librarians who collaborated with professors in the development of a subject-specific curriculum and information instruction (Tmanova et al., 2015) served as personal librarians and information mentors (Tmanova, 2014), as well as instructors to M.S. graduate students. The translational science librarians also helped develop educational and research material for Community-Based Participatory Research program and served as instructors and guest lecturers in Clinical and Translational Education Program. A direct real-

time research support service was developed to provide immediate support to scientists by streamlining the research information to Genetic Medicine and Personalized Medicine scientists. Information research support was provided to scientists during the laboratory and research meetings.

Another example of the ambassador model's effectiveness for developing information programs is disease crisis, which highlights the need for trusted, evidence-based information, access, and IC. During the Ebola crisis, resources were developed providing critical information for clinicians, residents, and fellows on disease management and patient care. Pertinent information was continuously monitored, verified, and streamlined for the dissemination of timely Ebola updates by utilizing Library's information tools. Furthermore, support was provided to the clinical community by attending clinical morning reports to assist medical residents, fellows, and clinicians in literature searches by applying EBM. Thus, the ambassador model effectively channeled information, knowledge, resources, and services to basic and clinical scientists, provided information resources for the educational curriculum in health informatics and clinical and translational investigation for the M.S. graduate programs, and contributed to the development of biomedical informatics core competencies in translational investigators.

Additionally, services to the biomedical community in support of research and library promotion, includes an evolving role of librarianship as information mentor, consultant, and educator using personalized communication and the research model of library professorship (Loesch, 2017; Tmanova, 2014; Tmanova et al., 2015). Inter- and multidisciplinary cooperation and collaboration improved access to library resources and services and facilitated meaningful relationships between librarians and the scientific community, development of targeted services to clinical and basic scientists, and innovation to enhance health communities.

Discussion

Scholarly communication and information ecosystems are continually evolving by adapting modern scholarly publication models, information access technologies, and information management strategies. Although information is now mainly distributed electronically, the library's role in society and healthcare remains crucial. The complexity of scholarly communication, excess of information resources, publication models, velocity and dynamics of information, and rapid development in biomedical research highlight the need for scholarly communication integration into military healthcare and medical education. Also, the diversity of research and information needs points to the importance of interdisciplinary, multidisciplinary, and cross-sector research information services and meaningful collaboration in science, clinical care, research, and education information needs for a diverse population's are met by implementing multidisciplinary and interdisciplinary information resources and hiring information specialists with multidisciplinary educational backgrounds to develop innovative

services and meaningful collaborations. In the military environment, scholarly communication is achieved by outreach to targeted communities (Chan, 2019; DOM, 2017).

The SCI is unique in the scope of information services offered in a military library and was developed to help military residents and clinicians navigate the information ecosystem and integrate innovative information into medicine to accelerate research, support clinical care, and facilitate scientific communication by offering services in a) literature analysis and synthesis, b) scientific writing and communication, c) systematic review collaboration, d) RQ, e) data management, and f) information literacy. Systematic Review Collaboration, RQ, Scientific Communication, and Educational Excellence are initiatives aimed at improving scholarly communication. To enhance the provided services, a Science Wise Advisory was established to improve research skills, literature analysis, and quality of publication by offering consultation conducting research, scholarly communication, bioinformatics, and health informatics (see Table 1). Also, the RQA is currently a pilot initiative aimed at extending library services in the research evaluation of scholarly publications by providing research impact evaluation services to GME programs to assess, evaluate, enhance research, and quality military scholarly publication. Data Management and Educational Excellence services are in the development phase. Collaborative information and educational liaisons were established with DETR, GME programs, NICOE, and U.S. Army BBF programs. Research information liaison with GME in Radiation Oncology and Diagnostic Radiology was developed to support their research, clinical care, and education mission.

The value of the library is channeled through the information resources and librarian's information expertise that includes an access and availability of the information resources in library and to expertise in librarians delivering the right information and services at the right time. Library liaisons with GME and the U.S. Army BBF program are an example of channeling information resources and information solution to liaison constituencies. Informationists are librarians with a specialized educational background and research expertise (Davidoff & Florance, 2000). Thus, informationist's support exceeds the information expertise by bringing another dimension of specialized proficiency to the liaison team by contributing to collaborative solutions to clinical problems.

In this context, leadership based on open-mindedness enables innovative practices in education, scholarly communication, and clinical care (Hunt, 1991). An example is support for the initiation of the systematic review collaboration service and the SCI. Prior to the initiation of the systematic review service, the bibliometric analysis of systematic review conducted at the WRNMMC showed ranked authorship from third to seventh in author ranking and collaboration with clinicians from other medical centers. The main challenges clinicians experience is the formulation of a systematic review question and study design confirming the challenges (e.g., systematic review methodology as too broad or narrow research or non-

searchable questions) identified in other studies (Nicholson et al., 2017) as well as our observations.

After initiation of the systematic review collaboration initiative, librarians contributed to three peer-reviewed published systematic reviews (first and second authorship rank), two conference presentations, and four registered systematic review protocols conducted in collaboration with medical center clinicians as first authors. Thus, librarian-clinician systematic review collaboration improves the quality of systematic review and increases the chances for article publication. Formal training in conducting systematic reviews and methodology (Koffel, 2015) enhances librarians' inclusion in the systematic review collaboration.

Also, systematic review collaboration serves as a teaching-learning model to enhance information literacy, literature appraisal skills, research skills, and critical thinking. This collaborative effort is especially effective in GME because it develops research, clinical, and information literacy skills. Through lectures, consultations, and collaboration trainees acquire knowledge of the systematic review methodology, standards, guidelines, literature search strategies, and literature synthesis. The information expertise of librarians raises the quality of clinical research and published reviews as well as increases article publication and citation rates, which consequently increases the quality of clinical and patient care (Saleh & Huebner, 2020).

Another value of DML librarian-clinicians systematic review collaboration is information mentoring and enhancing skills in residents for problem identification of problems in published literature. Such collaboration results in enhanced communication within the scientific community and healthcare settings as well as in the clinical decision-making process. This implementation of collaborative initiatives on conducting systematic reviews extend the value of the library's services and enhance the quality of systematic reviews and clinical care (Perrier et al., 2014). Thus, systematic review collaboration initiatives in military medical libraries, supported by library administration and command, can improve clinical practice and scholarship.

Analysis of scholarly publications by medical center researchers demonstrated not only the challenges but also prospects to foster skills in clinicians and residents. RQA provides GME program directors with an array of information regarding research productivity, assessment of residency and resident scholarly publication, impact of clinical research as well as future studies development. Furthermore, scholarly publications helps researchers understand academic and scientific development, influence, and research impact (Jarwal et al., 2009). In this way, scholarly publication analysis can enhance the quality of clinical research and care and decrease negligence and malpractice.

The information liaison with GME programs extends the library services from the traditional reference services to a specialized assistance by designing specific information services and instructions to a target group of information beneficiaries. Services such as scientific writing and communication, literature analysis and synthesis, and research data

management provide information recipients with an extended service set to enhance the quality of scholarly communication, information skills, digital and data literacy, and research ethics, in addition to raising the quality of published research and clinical care. SCI offers extensive scientific communication education to enhance information research skills in literature analysis and synthesis, critical thinking and analysis, and academic ethics.

Although these services are recognized as primary and essential for academic universities, this integration of scientific communication services in military healthcare is challenging. Adapting the ambassador model in the military medical setting could enhance the development of innovative information services and knowledge translation across basic medicine and military medicine.

However, the development of innovative research services may be challenging in the military environment. Obstacles to the integration of scientific information services are due to differences between the organizational and educational cultures, requirements for scholarly activities in residency programs, a focus on clinical practice instead of scientific research, evolving priorities with new leadership, and frequent change in personnel due to military rotations. (Lamb & Porro, 2015; Simms, 2018). The shift of emphasis on research or clinical practice depends on the priorities and mission of the command. Military medical centers that prioritize clinical practice may be somewhat disconnected from academic and scholarly activity and need advocacy when integrating library services from knowledgeable clinicians and scientists that value and recognize the impact of literacy (information, data, digital) on clinicians' lifelong careers as military medical practitioners.

Often, non-library instructors provide library information instruction in the military. This creates a competitive environment where librarian skills and competencies are intentionally inhibited, consequently sacrificing the quality of information instruction when preferentiality and favoritism are perceived (Andrade & Rivera, 2011). Preference and favoritism are not exceptions in the military and are among the many barriers observed in civil and military libraries (Andrade & Rivera, 2011; Fagbe et al., 2019; Lamb & Porro, 2015; Simms, 2018). Such an environment can potentially suppress the development of innovative initiatives, equality, and librarian empowerment, increase idea theft and misappropriations, and suppress professional development. Moreover, whenever there is a lack of a library champion in the controlling hierarchical and divided organizational culture, even the best-qualified librarian might not be able to implement scientific initiatives because of the rigid structures in military organizations (Fagan et al., 2021, 2022; Kirker, 2022; Lamb & Porro, 2015). A helpful approach for librarians might be the conduction of educational instructions on the evolution of scientific communication, academic publication, and the necessity of integration of information lectures into GME curricula. Outreach activities to biomedical communities on scholarly communication, Grand Round, information brochures, instructions, and library guides conducted in the military medical center could be extended further by developing an educational

module on scholarly communication, including a symposium (Chan, 2019; Dess & Wilson, 2019; English & Dancik, 2019).

An example of this approach is military residents' education on data-driven research and best research data management practices. A lecture on research data management was developed and taught through library instruction courses, GME didactic lectures, and guest lectures. This lecture was well received and attended by WRNMMC residents as well as USUHS students and faculty. Outreach on scholarly communication and ethical research conduction as collaborative education outreach is another approach to reach out to the biomedical community to enhance research, science, and education.

Next, the development of the scientific initiative that provides information services for interdisciplinary, multidisciplinary, and cross-sector research shows the impact and value of library information services in the rapidly evolving information ecosystem of biomedical research. The ambassador model is effective in the implementation of specialized information services in a range of disciplines such as science, bioinformatics, and health informatics (see Table 3). The skills in study development, grant writing, literature review, gap analysis, leadership, and entrepreneurship are useful in the development of SCI information liaisons and collaborative partnership to support research (identifying problems and issues, design, methodology, implementation, analysis), knowledge management, and intranet resources development (Kisilowska, 2016). The informationist provided specialized support to a small group of researchers (Williams et al., 2014) using soft skills (e.g., communication, networking, promotion, and marketing; flexibility and comfort with ambiguity, risk-taking, managing change, and adaptability; negotiation, persuasion, and influencing; organization, time management, and achieving goals; reflection on practice, ability to learn, and knowing the limits) and the informationist's' competencies described in Giuse and the ambassador models (Rankin et al., 2008; Tmanova et al., 2014).

Additionally, the essential skills, knowledge, and behaviors for everyday life situations in areas of advocacy were helpful in the development and implementation of SCI services in the military setting (Nzomo & Fehrmann, 2020). Other crucial skills in developing and implementing innovative services are interpersonal and inter-cultural knowledge, communication skills, emotional intelligence, cultural awareness, etiquette, digital netiquette, and ethics. The ambassador model in the military environment bridges information expertise to clinicians and residents and provides an added value of specialized expertise in various fields of science such as ICT, health informatics, and education (Tmanova et al., 2014). Its utilization for SCI development in the military medical center resulted in a range of scientific communication services, the research impact analysis of scholarly publication, liaison collaboration, and educational partnerships (see Tables 2–7).

Military medical teaching centers and academic civilian medical centers differ in their organizational structure. In the military medical center, the integration of innovative services

requires hierarchical approval and approval from various agencies, thus integrating ICT, educational technologies, and applications into the library, teaching, learning, and research may be challenging.

However, through teamwork, the library developed various educational collaboration partnerships and liaisons by enhancing its value to the medical military center. The successful liaison of translation science librarian with biomedical communities is also attributed to the Scholarly and Communication Support Team and the leadership. The library's diverse cultural environment, library administration, professorship, and librarianship stimulated innovation, professional growth, and advancement of the college's mission. The academic environment is characterized by culture and professional colleagues who encourage innovation, idea generation, and mentoring. An academic library environment is not constrained by the use of various open sources tools and educational environments. However, an implementation of innovative services, use of innovative ICTs, and new teaching methods require adherence to the DISA guidelines. Also, the flexibility of implementing innovative scientific, educational, and computing initiatives and open-source tools is limited to military medical libraries.

The emergence of collaborative partnerships and subject-specific services highlights the value of information specialists and their contribution to the organizations they serve in research quality assessment (Gutzman et al., 2018; Tyler Nix & Smith, 2019), interdisciplinary research (Smith et al., 2014), and medical education (Tahmasebi et al., 2020). Librarians can promote the value of information services to the military command by conducting information metrics of library information services, offering an impact analysis of provided services, and raising the quality of library instruction from generalized to subject-specific services. Also, librarians must be flexible in providing information services by recognizing command priorities. This is possible when they have extensive knowledge and experience in traditional library services, interdisciplinary and multidisciplinary research experience, subject-specific expertise, and scientific communication skills (Polger, 2010). Other contributing aspects of a librarian's success are self-efficacy, adaptability, flexibility in response to changing military mission and priorities, and willingness to study and acquire new knowledge, skills, and competencies.

Future initiatives include the implementation of RQA and Data Management Planning initiatives. As a pilot these initiatives were tested on a small population. The next planned step is to introduce these in GME programs and clinical departments before formalizing as SCI services offered to residents and clinicians. The Information Education service is also in the development phase and has been discussed with the GME program directors, clinical departments, and command. The information specialist is closely coordinating these services with the library director and engages in a decision-making process to develop collaborative educational partnerships. Thus, piloting a small and unique SCI service to a targeted group in the military medical community led by an experienced and well-educated informationist provides residents

and clinicians with the range of services and can introduce a valuable intellectual asset for the library and military command.

The SCI initiated in 2018, including existing services created in 2015, resulted in the integration of information research lectures in GME didactics, enhanced information research skills and competencies in residents, and a higher quality of published articles. Leaders who value scientific communication and information literacy encourage the expansion of such initiatives, in contrast to leaders that overlook librarians' roles (Hunt, 1991; Johnson et al., 2017). The SCI services highlight the need to think about the value of science, information science, and the scientific communication skill set required for providing quality clinical care, conducting research, and offering military medical education in the 21st century. SCI serves the target user group with quality resources and expertise, meeting their unique needs on time. The ambassador model bridges the library and military medical center community by providing the right information at the right time, enhancing scholarly productivity, and serving as an information consultant, mentor, and instructor. The informationist increases the value of library services through liaison and collaboration to solve problems and issues in clinical care. Interdisciplinary and multidisciplinary research experience may lead to collaborative endeavors in translating basic science into clinical care and mapping scientific discovery.

The evolution of library services highlights the need to embrace the integration of interdisciplinary and multidisciplinary services and subject-specialty professionals. Simultaneously, the integration of such services requires the support of the library administration and the military command to help the informationist develop, promote, and implement SCI services. The digital age and emerging ICTs are prompting changes to library services to meet the needs of 21st century information users.

Conclusion

The SCI consists of traditional library and information services, new inter-and-multidisciplinary services, collaboration, and liaison transition the library and librarians toward collaborative scientific partnership and professorship and provides value-added services to scientific communities. Inter- and multidisciplinary education background and research experience, entrepreneurship, and leadership qualities contribute to the success of new initiatives in diverse educational environments. The ambassador model bridges the diverse communities and constructs the ground for initiating new initiatives at academic universities and military medical centers. Organizational internal and external forces, emerging ICTs, transformation of library services, and changing information distribution and scholarly communication models in the global information ecosystem within the current digital age and might affect the implementation of such initiatives in the military.

References

- ACGME. (2015). *ACGME Common Program Requirements (Residency)*. Accreditation Council for Graduate Medical Education Retrieved from <https://www.acgme.org/Portals/o/PFAssets/ProgramRequirements/CPRResidency2019.pdf>
- Andrade, R., & Rivera, A. (2011). Developing a diversity-competent workforce: The UA libraries' experience. *Journal of Library Administration*, 51(7-8), 692-727.
- Chan, C. (2019). Bringing them up to speed: Teaching scholarly communication to new graduate students. *LOEX Quarterly*, 45(4).
- Davidoff, F., & Florance, V. (2000). The informationist: A new health profession? *Annals of Internal Medicine*, 132(12), 996-998.
- Dess, H. M., & Wilson, M. C. (2019). Scholarly communication: The bewildering new world of scholarly communication: Helping faculty understand the issues. *College & Research Libraries News*, 64(4), 242-245.
- DOM, W. R. (2017). News you can use from your Research Education Services Team *GME Snapshot*, Spring 20. <http://tinyurl.com/walterreedmedicine>
- English, R., & Dancik, D. (2019). Scholarly communication: ACRL's new scholarly communication initiative: Addressing a growing crisis. *College & Research Libraries News*, 63(5), 356-359.
- Fagan, J. C., Ostermiller, H., Price, E., & Sapp, L. (2021). Librarian, faculty, and student perceptions of academic librarians: Study introduction and literature review. *New Review of Academic Librarianship*, 27(1), 38-75.
- Fagan, J. C., Ostermiller, H., Price, E., & Sapp, L. (2022). Faculty perceptions of academic librarians: Experts, connectors, and resource stewards. *New Review of Academic Librarianship*, 28(1), 79-116.
- Fagbe, A. O., Fagbe, T., & Folorunso-Ako, A. O. (2019). Diversity management practices in academic libraries in the age of globalization. *European Journal of Research in Social Sciences Vol*, 7(3).
- Gutzman, K. E., Bales, M. E., Belter, C. W., Chambers, T., Chan, L., Holmes, K. L., Lu, Y.-L., Palmer, L. A., Reznik-Zellen, R. C., Sarli, C. C., Suiter, A. M., & Wheeler, T. R. (2018). Research evaluation support services in biomedical libraries. *Journal of the Medical Library Association: JMLA*, 106(1), 1-14. <https://doi.org/10.5195/jmla.2018.205>
- Halliday, L. (2001). Scholarly communication, scholarly publication, and the status of emerging formats. *Information Research*, 6(4), 6-4.

- Hunt, J. G. (1991). *Leadership: A new synthesis*. Sage Publications, Inc.
- ITS Annual Report. (2014). *Information Tecnology Service Annual Report: The Right Informaiton at the Right Time*. Weill Cornell Medical College Information Technologies & Services. <https://its.weill.cornell.edu/sites/default/files/2013-2014-annual-report-final.pdf>
- Iyengar, S., & Massey, D. S. (2019). Scientific communication in a post-truth society. *Proceedings of the National Academy of Sciences*, 116(16), 7656-7661. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6475392/pdf/pnas.201805868.pdf>
- Jaguszewski, J., & Williams, K. (2013). *Transforming liaison roles in research libraries: New roles for new times*. Washington, DC: Association of Research Libraries. <https://hdl.handle.net/11299/169867>.
- Jarwal, S. D., Brion, A. M., & King, M. L. (2009). Measuring research quality using the journal impact factor, citations and 'Ranked Journals': lunt instruments or inspired metrics? *Journal of Higher Education Policy and Management*, 31(4), 289-300.
- Johnson, A., Rodkey, D., & Bates, T. (2017). The medical librarian: The unsung enablers of military academic medicine. *MOJ Orthopedic Rheumatology*, 9(4), 00361.
- Kirker, M. J. (2022). " Am I a teacher because I teach?": A qualitative study of librarians' perceptions of their role as teachers. *portal: Libraries and the Academy*, 22(2), 335-354.
- Kisilowska, M. (2016). Competencies of Information Professionals in the Context of Dynamic Information Needs of Health Care Staff. *Zdrowie Publiczne i Zarzadzanie* 14(2). <https://doi.org/10.4467/20842627OZ.16.012.5574>
- Koffel, J. B. (2015). Use of recommended search strategies in systematic reviews and the impact of librarian involvement: A cross-sectional survey of recent authors. *PLoS One*, 10(5), e0125931. <https://doi.org/10.1371/journal.pone.0125931>
- Lamb, C. J., & Porro, B. (2015, First Quarter). Next steps for transforming education at national defense university. *Joint Force Quarterly* 76, 40-47. https://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-76/jfq-75_40-47_Lamb-Porro.pdf
- Latham, J. R. (2013a). A framework for leading the transformation to performance excellence part I: CEO perspectives on forces, facilitators, and strategic leadership systems. *Quality Management Journal*, 20(2), 12-33.
- Latham, J. R. (2013b). A framework for leading the transformation to performance excellence part II: CEO perspectives on leadership behaviors, individual leader characteristics, and organizational culture. *Quality Management Journal*, 20(3), 19-40.

- Loesch, M. F. (2017). Librarian as professor: A dynamic new role model. *Education Libraries*, 33(1), 31-37.
- Nicholson, J., McCrillis, A., & Williams, J. D. (2017). Collaboration challenges in systematic reviews: A survey of health sciences librarians. *Journal of the Medical Library Association: JMLA*, 105(4), 385.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5624428/pdf/jmla-105-385.pdf>
- Nzomo, P., & Fehrmann, P. (2020). Advocacy engagement. *Journal of Information Literacy*, 14(1), 41-65.
- Perrier, L., Farrell, A., Ayala, A. P., Lightfoot, D., Kenny, T., Aaronson, E., Allee, N., Brigham, T., Connor, E., & Constantinescu, T. (2014). Effects of librarian-provided services in healthcare settings: A systematic review. *Journal of the American Medical Informatics Association*, 21(6), 1118-1124.
- Polger, M. A. (2010). The informationist: Ten years later. *Journal of Hospital Librarianship*, 10(4), 363-379. <https://doi.org/10.1080/15323269.2010.514556>
- Rankin, J. A., Grefsheim, S. F., & Canto, C. C. (2008). The emerging informationist specialty: A systematic review of the literature. *Journal of the Medical Library Association*, 96(3), 194-206. <https://doi.org/10.3163/1536-5050.96.3.005>
- Saleh, A. A., & Huebner, F. (2020). *Characteristics and impact of librarian co-authored systematic reviews: A bibliometric analysis*.
<https://doi.org/10.1101/2020.02.14.20023119>
- Sawant, S. (2012). Transformation of the scholarly communication cycle. *Library Hi Tech News*, 29(10), 21-24.
- Simms, R. (2018). *A Qualitative Study Existence of Favoritism within US Army Promotion System for Staff Sergeant 42A through Sergeant Major 42A*. Northcentral University.
- Smith, J. E., Brandenburg, M. D., Conte, M. L., & Song, J. (2014). Innovative information service development: Meeting the information needs of an interdisciplinary, cross-sector research complex. *Journal of the Medical Library Association*, 102(1), 8-13.
<https://doi.org/10.3163/1536-5050.102.1.004>
- Tahmasebi, M., Adibi, P., Zare-Farashbandi, F., Papi, A., & Rahimi, A. (2020). The educational role of clinical informationist on improving clinical education among medical students: Based on Kirkpatrick model. *Journal of Education and Health Promotion*, 9, 28-28.
https://doi.org/10.4103/jehp.jehp_439_19
- Tennant, M. R., Butson, L. C., Rezeau, M. E., Tucker, P. J., Boyle, M. E., & Clayton, G. (2001). Customizing for clients: Developing a library liaison program from need to plan. *Bulletin of the Medical Library Association*, 89(1), 8.

- Tmanova, L. (2014). *Personal librarian – an instructor, consultant, and information resources mentor*. Medical Library Association, Chicago, IL.
- Tmanova, L., Albert, P., & Wright, D. (2014). *Library: A bridge connecting biomedical science, education, clinical practice, and community*. Annual Medical Library Association Chicago, IL.
- Tmanova, L., Ancker, J., & Johnson, S. (2015). Integrating an informationist into graduate education: Case study with preliminary results. *Medical Reference Services Quarterly*, 34(3), 296-310.
<https://www.tandfonline.com/doi/full/10.1080/02763869.2015.1052692>
- Tyler Nix, A., & Smith, J. E. (2019). Research impact core: A research impact initiative at the University of Michigan. *Medical Reference Services Quarterly*, 38(3), 260-270.
<https://doi.org/10.1080/02763869.2019.1623618>
- Williams, J., McCrillis, A., McGowan, R., Nicholson, J., Surkis, A., Thompson, H., & Vieira, D. (2014). Leveraging technology and staffing in developing a new liaison program. *Medical Reference Services Quarterly*, 33(2), 157-166.
<https://doi.org/10.1080/02763869.2014.897515>

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