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Adapt and advance: the Medical Library Association's journey through innovation and change

Kevin Baliozian

See end of article for authors' affiliations.

INTRODUCTION

Kevin Baliozian, CAE, MLA, is the Executive Director of the Medical Library Association (MLA), a role he has held since January 2015 when appointed by the MLA board of directors. His mandate included enhancing the association's value and relevance to its members and the broader profession and ensuring its long-term sustainability amid the challenges of the evolving health information landscape. This includes navigating challenges such as library closures, the necessity for health information professionals to develop new skills, tightening library budgets, and the impact of the COVID-19 pandemic on MLA's finances and business models.

This article examines key inflection points of the last twenty-five years and the critical role of the board of directors in setting the direction of MLA. It reviews ten years of strategic initiatives, building the larger picture of significant change for the association and the building of a better future.

THE BOARD OF DIRECTORS COMMITMENT TO CHANGE

In December 10, 2014 twelve members of the Medical Library Association (MLA) board sat in a semicircle as I took my seat, one of two finalists for the position of executive director. This was the culmination of a months-long selection process that had started with more than 80 applicants. To prepare for the kickoff topic, "*strategic planning with a future focus, taking into consideration the generational shift*," I had studied MLA mission statement, business plan, strategic plan, presidential priorities, and committee reports, and had spoken with several health sciences librarians for their take on the major disruptions affecting the health information ecosystem.

My twenty-minute presentation laid out the foundation of a successful strategic planning process: an MLA strategic plan should be a) consistent with MLA's mission, b) always turned to the future, and c) lead to action taking. It should identify critical high-priority areas-of-action and define several goals each with their specific objectives and metrics. An area rises to a high priority area-of-action

when a) a critical set of issues require the board's attention, focus and action, b) the issues have significant and meaningful impact on MLA's ability to deliver on its mission, and c) the impact can be positive (opportunity) or negative (problem if not addressed).

I pointed to the inconsistent goals presented in the documents, the annual strategy shifts disruptive to the cohesiveness and alignment of MLA components, and the lack of a long-term focus and vision. In conclusion, I observed that 70% of the MLA strategic statements used the action word "continue." I paused, asked the board: "*do you want to change or continue?*" and paused again.

One by one, board members expressed their commitment to changing MLA and why doing so was in their view critical. The discussion had morphed into a strategic facilitation session, as the ultimate "behavioral interview," a technique used to assess a candidate's future performance by asking questions about past behavior in similar situations to the new roll, which would be an essential test of the alignment between the vision of the board and the fit of the executive director.

MLA 2004-2005 board members were united in their belief and understanding that the association was at an existential inflection point, that business as usual was no option, and that there was a sense of urgency for change.

NAVIGATING CHANGE THROUGH DISRUPTIONS

The MLA board is elected and entrusted by its members to set the course of the association and allocate the association's limited resources to achieve those goals. *Mission* is about the relevance of MLA as an association to provide value to health information professionals, advance the health information profession as a whole, and be ahead of the curve in identifying the needs of the future. *Sustainability* is about the judicious management of the finances of the organization (revenues higher than expenses over time), and the prioritization of limited resources (volunteer time available to serve the association, staff time, and funding).

The imperative to prioritize resources to focus on the most essential programs stems from the board and management joint responsibility to achieve both “mission” and “sustainability”. The success or failure of an association also hinges, over time, on the critical decisions in response to external disruptions.

The following are examples of those situations from the last 25 years.

In her April 20, 1998 *Bulletin of the Medical Library Association* article *Efficiency, stability, recognition, resolution* [1], Carla J. Funk, MLS, MBA, CAE, Hon FCLIP and MLA executive director from 1992 to January 15, 2015 tells the story of MLA’s transition from an all-volunteer organization to one with 18 staff members in 1996. Funk’s article records the terms of MLA executive directors and describes the technology shifts affecting day-to-day operations of MLA headquarters. “When Raymond A. Palmer (1982-1991) became executive director in 1982, there was a focus on streamlining headquarters operations, strengthening dwindling financial resources, and generally doing more with less.” Financial strains were a concern during Palmer’s and Funk’s tenures and continue to be even 2024 as MLA staffing has decreased to 12 full-time equivalent employees while still relying heavily on volunteer members.

In their 2009 *JMLA* article *Trends in hospital librarianship and hospital library services: 1989 to 2006* Patricia L. Thibodeau, AHIP, FMLA, and Funk discussed hospital library closures [2]. They concluded that “Survey data support reported trends of consolidation of hospitals and hospital libraries and additions of new services. These services have likely required librarians to acquire new skills.” Demonstrating the value of the health information profession, especially in the clinical care setting, remains a focus of today’s MLA. While it is a focus, it is nonetheless difficult to counter the continuing trend of library closures as hospital closures and consolidation have increased in the past 25 years [3].

In his 2022 MLA *Janet Doe Lecture* and subsequent *JMLA* article, *Health science libraries in the emerging digital information era: charting the course*, (Michael Kronenfeld, MLS, MBA, AHIP, FMLA, presented a retrospective and analysis of the major disruptions and resulting opportunities of digital transformation [4]. He said that “the great challenge medical library professionals are facing is how we evolve and respond to the emerging digital era. If we successfully understand and adapt to the emerging digital information environment, medical librarians/Health Information Professionals (HIPs) can play an even greater role in the advance in the health care of our nation and its residents.” That has been the case since MLA’s founding on May 2, 1898, and remains the case today with the emerging and accelerating use of artificial intelligence (AI).

In his 2005 *JMLA* article *The Impact of Open Access*, T. Scott Plutchak, *JMLA* editor at the time, analyzed the effects of

the 2001 decision by the MLA Board to make *JMLA* an open access journal after its content became available on *PubMed Central* [5]. On the *mission* objective, Plutchak writes: “I can think of few things more likely to gladden the heart of an editor than this kind of evidence of the reach and impact of the journal on which he lavishes so much time and attention. I have no doubt that we would not be seeing these sorts of numbers if *JMLA* were not freely available on the Web. From the standpoint of readership and reach, MLA’s experiment with open access would appear to be a resounding success.”

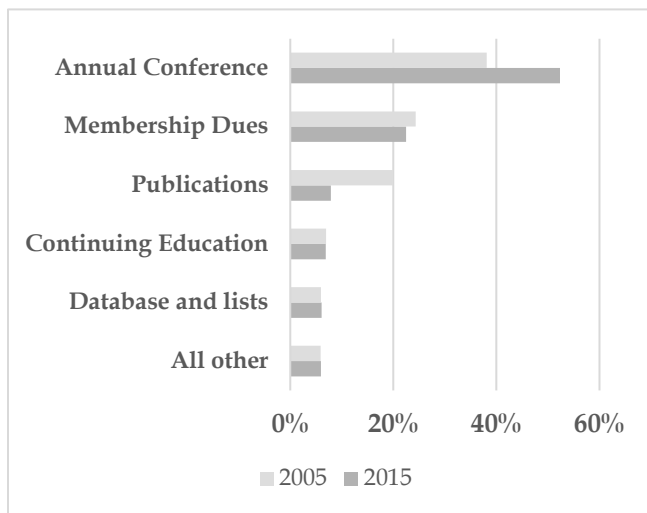
On the *sustainability* objective, Plutchak writes, “While the loss of the *excess* revenue would not cripple the association [MLA], it would certainly require some shifting of priorities and put additional pressure on other revenue sources. If open access were to result in a significant loss of the *total* revenue, the very existence of the journal could be imperiled. The risk is not trivial.”

A LOOMING FINANCIAL CRISIS

The financial risk to MLA identified by Plutchak did materialize. *JMLA* revenue plummeted from \$526,691 (19% of total operating revenues) in 2001, to zero in 2023 when the journal fully transitioned away from print. Indeed, the MLA Board was forced to “shift priorities” as Plutchak described and utilize other revenue sources to safeguard the long-term sustainability of the journal. *JMLA* operates with an all-volunteer editorial board and today funds its costs with the revenues generated from MLA memberships and the annual conference.

By 2015, the sustainability of MLA primarily hinged on just two main revenue streams: membership dues and the annual conference. The declining number of health sciences librarians resulted in a decrease in membership, posing additional financial challenges. Specifically, *real* membership revenue fell by 28% from 2001 to 2015 when adjusting for inflation (*nominal* revenues of \$642,753 in 2001 and \$616,106 in 2015 adjusted by a 33% Consumer Price Index increase over the same period). Consequently, the annual conference grew in financial significance, accounting for 51% of the total operating revenue in 2015, up from 38% in 2001. This in turn intensified MLA’s dependence on exhibits and sponsorships, making vendor support a critical component of MLA’s financial health and introducing increased risk.

Figure 1 MLA Revenue Diversification 2001 vs. 2015



This graph shows MLA revenues as a percentage of total revenues. It illustrates the significant decrease in publication revenue from 2001 to 2015 offset by a corresponding increase in the annual conference, with all other revenue percentages stable. (All data from MLA 2001 and 2015 Audit Reports).

Table 1 MLA Revenue Diversification 2001 vs 2015 Part 2

	2001	2015
Annual Conference	\$ 1,008,395	\$ 1,434,087
Membership Dues	\$ 642,753	\$ 616,105
Publications	\$ 526,691	\$ 215,316
Continuing Education	\$ 184,453	\$ 189,185
Database and Lists	\$ 157,290	\$ 165,724
All other	\$ 155,289	\$ 163,709
Total Operating Revenue	\$ 2,644,300	\$ 2,738,450

Table 2 MLA Revenue Diversification 2001 vs 2015 Part 3

	2001	2015
Annual Conference	38%	52%
Membership Dues	24%	22%
Publications	20%	8%
Continuing Education	7%	7%
All Other	6%	6%
Database and Lists	6%	6%
Total Operating Revenue	100%	100%

By 2015, MLA’s lack of diversification in its revenue streams, compounded by a trend of declining revenues due to shrinking library budgets, led to the emergence of systemic operational deficits. While financial revenues from MLA’s reserves could temporarily offset these operational deficits, there was no long-term strategy in place to address the underlying issues with the MLA business model. A sustainable solution to diversify and stabilize MLA’s financial sources was urgently needed to address these challenges.

The 2014-2015 board of directors opted for a *growth* strategy to achieve long-term sustainability, with a prudent use of MLA reserves to invest in the future.

MLA had the financial reserves to transform itself and invest in its future, and it would do so by increasing the mission value AND revenues through diversification.

A *cost-cutting* strategy would likely have resulted in an association *death spiral*: budget cuts lead to fewer MLA programs, which leads to loss of value offered by MLA, which leads to loss of engagement, which leads to loss of revenue, which leads to more program cuts.

The following graph compares the change of operating revenues, from the base year of 2005 to 2005, for MLA, the Special Libraries Association (SLA), the American Library Association (ALA) and the American Association of Law Libraries (AALL) [6].

Figure 2 2005-2020 Operating Revenues

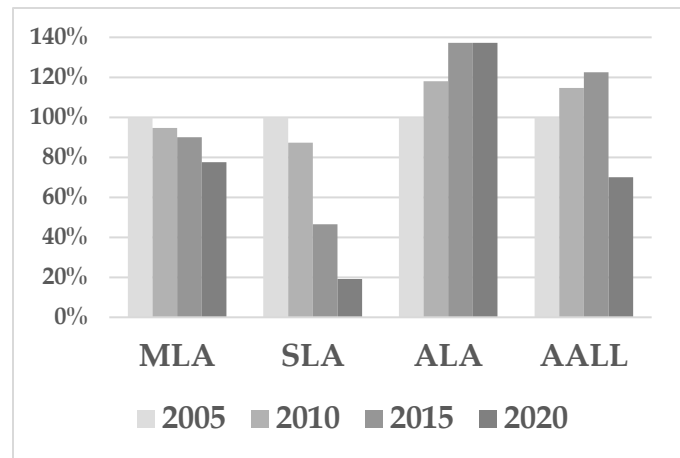


Table 3 2005-2020 Operating Revenues Part 2

	MLA	SLA	ALA	AALL
2005	\$ 3,173,308	\$ 6,889,403	\$ 36,435,188	\$ 3,042,633
2010	\$ 3,006,283	\$ 6,012,166	\$ 43,002,503	\$ 3,491,219
2015	\$ 2,856,768	\$ 3,199,898	\$ 49,989,270	\$ 3,726,183
2020*	\$ 2,459,909	\$ 1,319,529	\$ 50,033,474	\$ 2,131,711

While MLA operating revenues decreased by 20% from 2005 to 2020, SLA revenues show a downward spiral, ALA revenues are resilient, and AALL revenues grew until Covid-19 caused the cancellation of their 2020 in-person annual conference. MLA mitigated the negative financial effects of Covid-19 on its 2020 revenues by transitioning to a successful virtual conference and by launching the all-access *passport* to MLA online education. In 2023, MLA pre-financial audit operating revenues are back above \$3M [6]. (Data from public 990 filings: total revenues less financial revenue).

SETTING THE STRATEGY

The 2014-2015 and subsequent boards of directors leveraged the analysis of the *Future's Taskforce* (2012-2014). In their October 2014 report, the taskforce recommended to a) establish areas of practice of the association, b) expand the membership base, c) transition to a year-round model less dependent on in-person annual conference, d) streamline the organizational structure (simplify, clarify, eliminate, reduce), and d) establish new positions for MLA governance such as the *Innovator-in-Residence*, the *Data Curator/Analyst* and the *Instructional Designer/Learning Technologies Coordinator*.

The transition to a year-round model less dependent on the conference meant developing a continuing education program where MLA would “take responsibility for creating courses and providing resources for members to create courses, rather than mostly approving courses created by individuals and other organizations” and would “increase time devoted to networking and programming and decrease time devoted to business meetings and other administrative functions”.

In streamlining the organization structure, the taskforce recommended to “clarify the purpose of sections and focus their activities on content rather than administration. Sections could function as *Working Groups* focused on projects that benefit the membership and profession, with an eye to creating a work product such as a webinar, program, white paper, journal article, position paper, or set of standards. Multiple sections with overlapping interests could combine talents and work on a joint project.” The taskforce also recommended to “possibly rename *Special Interest Groups* (SIGs) to *Caucuses* which implies more of a voice in the organization.”

The *Future's Taskforce* 2014 recommendations met with considerable pushback when presented, due to opposition and rising tensions among MLA members regarding the proposal to streamline Sections and SIGs. Many Section members felt that this suggestion amounted to a loss, as no alternative clear, collective vision for an improved future state of MLA communities had been convincingly presented.

The transformation of MLA communities had started on the wrong foot in 2014, and it would take several years to achieve “buy-in” from members and participants.

MLA STRATEGIC GOALS (2015-2024)

The board created a strategic goal specific to the transformation of *Communities - Sections and SIGs* (May 2016 to May 2020) with key premises that were to a) encourage and facilitate community activities throughout the year, rather than just focus on programming at the annual conference, b) combine the dual structure of paid sections and open SIGs into a single set of caucuses all members could join at no extra charge, c) reintegrate the funds of individual Sections into MLA general funds, and c) sustain the funding of Section awards and scholarships by having those supported by the MLA endowment.

The board convened a diverse coalition of members to communicate, gather feedback, and refine strategies through two years of dialogue. The implementation of the *MLA Diversity, Equity, and Inclusion* (DEI) strategic goal (May 2017 to May 2020) played a crucial role in making a compelling case for community transformation.

By eliminating the dual hierarchy between Sections and SIGs and the cost barrier to community participation (no additional fee to membership), and by merging Section treasuries to benefit the whole, the community transformation roadmap presented a strong argument for equity and inclusion, which in turn would enhance diversity within the organization.

The objective of the *What MLA Does* strategic goal (February 2015 to May 2017) was to identify MLA programs that were strategic and relevant to members and improve or eliminate those that were not. An immediate focus was to speed up decision making and execution, and ensure that the association provided value, and did so in a financially sustainable way. An essential outcome was to define the overall vision to spawn new strategic goals aimed at improving the MLA member experience (e.g. technology, communities, diversity, equity and inclusion, annual conference) and increasing the value of MLA to the broader audience (education, areas of expertise, new audiences).

The objective of the *MLA Technology* strategic goal (February 2015 to May 2018) was to improve the online user experience and access to information by members, customers, and the public. This included growing community interactions that were, at the time, occurring across multiple and disparate websites and communication channels, many outside of the association's operations. MLA introduced new technology that centralized the association activities into a coherent experience and branding, and at a lower cost.

In June 2024, MLA introduced a new technology platform to once again significantly increase user experience and

staff productivity, addressing both *mission* and *sustainability*.

The *Communities (Sections and SIGs)* strategic goal (May 2016 to May 2020) discussed above was followed by a second *Communities (part 2)* strategic goal (November 2020 to May 2023) that aimed to encourage community-driven high-quality and relevant content, ensure a professional home within MLA for all health information professionals at all career stages, empower MLA members at the grassroots level, and increase member engagement. In 2023, caucus participation by MLA members was an impressive 89%, with each participant joining an average of 4.8 caucuses [2023 MLA Business Meeting Executive Director Report].

The objective of *Annual Meeting Innovation* strategic goal (May 2018 to May 2020), extended by the *Reinvent the MLA Meeting Experience - Part 2* strategic goal (November 2020 to May 2023) was also aligned with the *Future's Taskforce* recommendations: more content, fewer association meetings, improved experience and value for broader audiences. The timing proved auspicious: the COVID-19 pandemic thrust MLA into a new era of online engagement, prompting the development of entirely virtual annual conferences in 2020 and 2021, followed by hybrid formats (in-person + live-virtual + on-demand) in subsequent years.

The disruption brought about by the Covid-19 pandemic served as a catalyst for enduring positive changes within the association. Committees and caucuses now convene virtually throughout the year, as do MLA business meetings, the annual awards ceremony, the presidential inaugural and open forums.

In 2018, MLA collaborated with the *National Library of Medicine* and the *Public Library Association* (a section of the *American Library Association*) to organize a 2018 symposium on *Public Health Information* as part of the MLA annual conference. This event attracted 150 public librarians with interest in public health as well as many MLA members with an interest in consumer health.

After the 2020 and 2021 hiatus of in-person annual conferences due to the Covid-19 pandemic, MLA reintroduced special content programming at the 2022 annual conference, designed for both MLA members and a broader audience, using the time slots freed up by association activities that had transitioned online. These sessions covered: *Collection Development, Leadership and Management, and Data Services and Management*.

The launch of the *Education* strategic goal (February 2015 to November 2020) was fundamental to MLA's long-term transformation, and to its resilience during the pandemic. The objectives were to position MLA as the go-to education resource for health information professionals, foster excellence in the professional practice and leadership of health sciences library and information professionals and diversify revenue outside of membership and annual conferences. Over just a few

years, MLA created a structured educational curriculum with robust offerings, built on revised *MLA professional competencies* (2017) introducing measurable performance indicators by skill level, with an effective collaboration between volunteer committees, headquarters staff, subject matter experts and instructional designers. MLA's approach to education was now structured and intentional, supported by technology and marketing.

In her 2022 article *Partnering for education and career development of librarians and information specialists*, Ruth Holst, AHIP, FMLA, describes the collaboration between MLA and the *National Network of Libraries of Medicine* (NNLM) for the creation of two MLA specializations: *Consumer Health Information Specialization* (CHIS) in 2001, and the *Disaster Information Specialization* (DIS) in 2012 [6].

The development of MLA specializations is the result of MLA's rigorous process to define essential skills and performance indicators for specific areas of practice deemed central by the organization. This process includes targeted educational programs to help health information professionals acquire those skills, some in partnership with NNLM. MLA launched the *Data Services Specialization* (DIS) in 2021, and the *Systematic Review Services Specialization* (SRSS) in 2022.

The objectives of the *Research Imperative* strategic goal (May 2015 to May 2018) set a high bar for MLA excellence to a) positively impact institutional and stakeholder outcomes, such as impacts on clinical care, student learning, and scientific research, b) improve the quality of health information services through the use, creation, and application of evidence in daily practice and processes, c) foster a culture of employer support for evidence-based practice, assessment, and related research, and d) position MLA as the voice for evidence-based practice and matters related to research and statistics about health sciences libraries and librarians.

The initiative led to the establishment of the *MLA Research Training Institute* (RTI) supported by two grants from the *Institute of Museum and Library Services* (IMLS). The RTI is dedicated to fundamentally advancing health information research and promoting evidence-based practices in healthcare [8]. From 2018 to 2023, more than 100 participants have completed the year-long program, and 35 are participating in 2024.

In 2020, MLA assumed ownership of the *Electronic Fund Transfer System* (EFTS) from the *University of Connecticut Health Center* (UCHC). UCHC, in collaboration with NLM, had launched the initial version of EFTS in 1996. While NLM's *DOCLINE* system matches lenders and borrowers for interlibrary loans (ILLs), MLA's EFTS serves as the online billing system for ILLs that facilitates the financial transactions. The board's strategic decision to develop and launch a new version of EFTS was pivotal in providing support to all libraries that must manage limited subscription resources, from large academic institutions to

non-academic and smaller libraries. This initiative also significantly contributed to MLA's goal of diversifying its revenue streams.

The objective of the *Building a Better Future* strategic goal (December 2020 to 2024) was to honor 125 years of MLA history and envision the future of the profession. In their JMLA article, "Welcome to the Future: Challenges and Opportunities Discussed in the Vision 2048 Task Force Open Forums 2021-2023" the *2048 Task Force* shares the results from surveys, interviews, and open comment sessions regarding the future of medical librarianship and the future of the association [9].

In launching the 2024 *Artificial Intelligence Imperative* strategic goal (May 2024 to May 2027), the board seeks for MLA to advance and promote health information practices with regards to the use of artificial intelligence (AI) by developing and implementing strategies to advance the AI skills and competencies of health sciences professionals, and advocate to employers, members, publishers, and the public the value, impact, and benefits of health sciences libraries and librarians in an AI world.

CONCLUSION

In exercising its duty of care, the board need only be *careful* and not *right*. Nevertheless, the strategic nature of the MLA board, the thorough and informed process it applies to reach its decision, its willingness to experiment, accept failure, and adapt have all contributed to an impressive *mostly right* record over the last fifteen years.

This series of board strategic decisions has been pivotal in strengthening MLA. While further creativity and diligent effort are necessary to fully realize MLA's transformation, these efforts have yielded substantial results. The association has experienced robust growth since 2022, enhanced relevance and value to member and non-member communities, and thrives on a vibrant culture characterized by engagement, inclusivity, and trust of its members and larger health sciences community.

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Diversity, equity, and inclusion initiatives in the Medical Library Association: a look back at the last twenty-five years

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Over the past twenty-five years, the Medical Library Association (MLA) has pursued a range of diversity, equity, and inclusion (DEI) initiatives. This article, written by members of the *Journal of the Medical Library Association (JMLA)*'s Equity Advisory Group (EAG), outlines significant measures taken to raise awareness about specific concepts, opportunities, and challenges related to DEI among MLA members. Topics discussed include the impact of influential Black, Indigenous, and people of color (BIPOC) leaders, the establishment of DEI and social justice-focused membership communities, and specific initiatives led by various working groups and committees which have served to strengthen MLA's commitment to diversity, equity, and inclusion during the last three decades.

Keywords: Diversity; equity; inclusion; history; retrospective; social justice

INTRODUCTION

The Medical Library Association (MLA)'s Diversity and Inclusion Task Force conducted a member survey in 2019, which focused on the key demographics of our field and on attitudes towards diversity and inclusion among MLA members. Of those surveyed, a number of notable demographic patterns were revealed. For example, 72% of respondents were white and 79% were female [1]. The self-reported demographics within MLA resemble the membership of the American Library Association (ALA), whose own survey conducted in 2017 found that 86% of its respondents were white and 81% were female [2]. These statistics suggest that both librarianship generally and medical librarianship specifically need to increase their racial, ethnic, and gender diversity to more accurately reflect the demographics and represent the concerns of the communities they serve. Within MLA, there has been a concerted effort to be more equitable and inclusive in the range of its programs and committees, and to increase diversity among its membership. This article highlights some of the diversity, equity, and inclusion (DEI) initiatives that have taken place within the last 25 years within MLA. These include the election and impact of influential BIPOC leaders such as Beverly Murphy and Naomi Cordero Broering; the establishment of DEI and social justice-focused membership communities including the African American Medical Librarians Alliance, Accessibility and Disability Caucus, Latinx Caucus, and Social Justice and Health Disparities Caucus; and key initiatives led by working groups and committees including the Diversity Committee, *JMLA* Equity

Advisory Group, and *MLA Reads* Virtual Book Discussion Group which have served to strengthen MLA's commitment to diversity, equity, and inclusion.

INFLUENTIAL LEADERS

Beverly Murphy, First African American MLA President

Beverly Murphy's trailblazing is exemplified by a series of firsts: first African American editor of the *MLA News* (2000), first African American chair of the Mid-Atlantic Chapter (MAC) of MLA (2002), first African American president since MLA's founding in 1898 (2018), and first African American recipient of the Marcia C. Noyes Award (2021). Despite the pressure and scrutiny placed on individuals when they are chosen to take on historically important roles, Beverly is widely-known for taking on these roles and challenges with "sass, elegance, pizzazz, and humor" [3].

Beverly has played significant roles in MLA including working on the *MLA* Professional Recruitment & Retention Committee, *MLA* Diversity and Inclusion Task Force, *JMLA* Editorial Board and Equity Advisory Group, *MLA* Nominating Committee, and the *MLA* Board of Directors. Starting with each unique individual in mind and culminating in a shared vision, she also orchestrated the "I Am *MLA*" campaign, which grew out of the need for us to all gravitate towards the collective understanding that we are *MLA* and it is up to us, as members and volunteers, to do what needs to be done for our

association. In addition to being a Noyes Award recipient, MLA's highest professional distinction, Beverly is an MLA Fellow, distinguished member of the Academy of Health Information Professionals, and was awarded by MAC with the Marguerite Abel Service Recognition Award and the Librarian of the Year Award.

Beverly has spent her entire career as a proponent of equity, diversity, inclusion, and belonging in librarianship. In her inaugural presidential address at MLA 2018, she said: "No matter what race we are, what color we are, what ethnicity we are, what gender we have, or whether we have physical issues – we are all information professionals, with a common goal, and that is to be an association of the most visible, valued, and trusted health information experts. Diversity drives excellence and makes us smarter, especially when we welcome it into our lives, our libraries, and our profession" [3]. Beverly's commitment to equity is not simply a bunch of words in a single speech. As coeditor of *Diversity and Inclusion in Libraries: A Call to Action and Strategies for Success* (Rowman & Littlefield, 2019), she helped to provide MLA with a framework and tools to build a profession where everyone has a role and can make significant contributions and positive changes. Beverly has helped to create an environment and culture where each of us is welcome to be ourselves while being responsible for our actions and words. This significant work was recognized when the North Carolina Library Association awarded her with the Roadbuilder's Award for Special Librarianship. Her work in librarianship will live on via the Beverly Murphy MLA Scholarship for Underrepresented Students which awards up to \$5,000 to a student who shows excellence in scholarship and potential for accomplishment in health sciences librarianship.

Naomi Cordero Broering, First Latinx MLA President

Naomi Cordero Broering (1929-2023) was the first Latinx person to serve as MLA president (77th president, 1996-1997). She was the 21st editor of MLA's *Bulletin*, and in 2003, received MLA's highest honor, the Marcia C. Noyes Award. Born in New York City to Puerto Rican parents, Broering and her family later relocated to California. She was raised both bilingual and bicultural, and excelled in her outreach to diverse populations in settings serving BIPOC, and most importantly, communities with a high incidence of HIV.

As MLA President, Broering identified five priorities with both short-term and long-term objectives: education and distance learning, membership development, research project for the creation of MLANET, electronic publishing, and advocacy for the profession [4]. Broering sought to improve MLA's capabilities in education and distance learning to expand continuing education opportunities for lifelong learning to MLA members, while leveraging existing technologies. Expanding MLA membership was a

significant endeavor as well, paving the way for a newer generation of information professionals. Under Broering's leadership, MLA added over three hundred new members to the association. During Broering's MLA Presidency, there was an expansion of MLANET's capabilities, development of electronic publishing of MLA publications, and advocacy for the library profession at meetings and events held by organizations like the American Hospital Association and the National Alliance for Caregiving, among others [4].

Broering leaves an enduring legacy in multiple roles as librarian, scholar, collaborator, visionary, advocate, prolific author, and avid supporter of MLA and the National Library of Medicine (NLM), as well as being the first Latinx person to lead MLA.

COMMITTEES, COMMUNITIES, AND WORKING/MEMBER GROUPS

From DEI Task Force to Diversity Committee

DEI initiatives were brought to the forefront of MLA when the Board of Directors decided to prioritize DEI as a strategic goal. Announced in December 2016 by Teresa L. Knott, AHIP (President, 2016-2017) and solidified as a goal by the Board in May 2017, Barbara A. Epstein, AHIP, FMLA (President, 2017-2018) issued a call for the formation of a Diversity and Inclusion Task Force (DITF) to actualize MLA's Diversity and Inclusion strategic goal. Chaired by Sandra G. Franklin, AHIP, FMLA, the DITF operated from September 2017 to May 2020 and included 12 additional members, along with MLA staff liaison, Tomi Gunn [5]. The DITF's aim was to "evaluate and improve MLA practices as they relate to diversity and inclusion," which led to the development of five goals to guide the task force's work:

1. Build activities and programs that create and sustain diverse, inclusive, and welcoming cultures and practices;
2. Ensure that members, volunteers, and staff have a high level of awareness of issues related to diversity and inclusion;
3. Ensure that what we do as an organization, and how we do it, reflects the essential values of diversity and inclusion;
4. Attract a diverse community of members that reflects the diversity of the profession and those we serve; and
5. Apply the best practices of professional associations with regard to diversity and inclusion [5].

The DITF collaborated with MLA members and leadership on various activities, conversations, initiatives, and made key recommendations, many of which were implemented during the time of the DITF and continue to influence the structure and work of MLA. Significant changes resulting from recommendations made by the DITF include:

- Review and revision of MLA’s vision, mission, values, and code of ethics and changes to language throughout all MLA documents, for example, changing Hispanic to Latinx. The motions were accepted and passed by the MLA Board on September 3, 2019 [5, supplemental Appendix D].
- Contribution to the Communities Transition, which involved collaboration with the Communities Task Force and MLA leadership to create a more inclusive professional experience for membership. Two significant recommendations approved by the MLA Board in 2018 – replacing the dual-level of MLA member communities (sections and special interest groups) with a single tier (caucuses) and eliminating the financial barrier to joining an MLA member community by doing away with community dues – were implemented with other changes in September 2019, with an immediate positive effect on MLA’s diversity and inclusion [5].
- The Diversity and Inclusion Task Force 2019 Survey was the first of its kind for the organization. In October 2019, the online survey administered to the membership revealed the demographics of the association and gave more clarity about how members feel about MLA as well as the DEI efforts of the association [1].

Both the MLA Diversity and Inclusion Task Force Report [5] and the Diversity and Inclusion Task Force 2019 Survey Report [1] document many more initiatives and provide deeper insights into the transformative work of the Task Force.

In 2020, the DITF became the MLA Diversity, Equity, and Inclusion (DEI) Committee, led by Xan Y. Goodman, AHIP, the committee’s first chair. The MLA Diversity, Equity and Inclusion (DEI) Committee is now the coordinating and advisory body that evaluates and seeks to improve MLA practices and programs as they relate to DEI. The committee aims to:

- promote and encourage a diverse MLA leadership at all levels;
- be a voice for DEI within MLA;
- advise and collaborate with MLA communities and committees on DEI-related issues;

- encourage, recommend and contribute to DEI-related programs, events, and resources for MLA members and the public;
- recommend strategies to increase diversity in the profession; and
- lead special DEI-related projects as directed by the Board of Directors [6].

The DEI committee continues the work of the original task force in many ways, such as:

- The Living Library Program was established by original DITF member Amy Taylor for members to learn about each other’s diverse life experiences that can lead to understanding and greater connections through sharing these stories in a safe space.
- Collecting and disseminating diverse conference programming and learning opportunities offered by MLA.
- Implementing an infrastructure to gather what various MLA Committees are doing to promote DEI and facilitate collaboration, to gather information related to DEI best practices and information, and to inform MLA members about DEI committee activities.

African American Medical Librarians Alliance (AAMLA)

The African American Medical Librarians Alliance (AAMLA) is an affinity group within MLA formed in response to the necessity for a space where information professionals from historically marginalized communities could unite and ensure their representation within the organization. Before 2000, African American information professionals within MLA relied on informal communication throughout the year to foster collaboration and networking, typically culminating in social gatherings like dinners and other activities during MLA conferences. After years of social networking, it became apparent that strategic development within the Association was essential for advancement and success in a field predominantly occupied by white women. After meeting the criteria to form as a Special Interest Group (SIG), the African American Medical Librarians Alliance SIG was officially recognized in 2000 at the Annual MLA meeting in Vancouver, Canada.

Today, the AAMLA Caucus of MLA stands committed to bringing the challenges and issues of historically excluded information professionals to the forefront. The caucus’ priorities include cultivating opportunities for recruiting and retaining diverse librarians and information professionals, mentoring and leadership, developing expert skill sets, and increasing engagement within MLA. AAMLA’s role is to help all medical information professionals understand and appreciate the dynamics of

cultural diversity, as well as recognize and address the needs for cultural competence and humility in healthcare environments. In accomplishing these goals, AAMLA ensures that the efforts, achievements, and accomplishments of African American MLA members are highlighted as a personal identity of AAMLA. Membership in AAMLA is open to all members of the Medical Library Association and is currently composed of information professionals who are largely employed at academic institutions, hospitals, and community colleges throughout the United States.

Accessibility and Disability Caucus

With the formation of the DITF in 2017 under Sandra G. Franklin, there was an awareness of the concerns of marginalized groups, including people with disabilities. On the Task Force, JJ Pionke was the voice of disability and accessibility. When the Annual Meeting Innovation Task Force was formed in 2018, JJ was the liaison between the two task forces and an advocate for improved accessibility of the annual meeting. MLA efforts toward meeting accessibility improvements have included a quiet room for meditation and sensory safe place when experiencing sensory overload, alternative quiet activities like coloring and board game night, and a portable walking maze for meditation. JJ spearheaded the Accessibility and Disability Caucus in 2019, which has continued JJ's work through various activities including educational and outreach to both the membership and at the annual meetings.

Latinx Caucus

In 2014, the MLA Latinx Caucus was established and was known initially as the Latino Special Interest Group. In its first year, the group's two co-conveners, Brenda Linares (MLA president-elect, 2024-2025) and Diana Almader-Douglas, led the collaborative effort with other Latinx health sciences librarians and MLA members. It was the second affinity group of MLA, after AAMLA, and established to lead efforts to acknowledge and address issues related to, and affecting, the Latinx community. In 2024, the Latinx Caucus is celebrating its 10-year anniversary. Over those first ten years, members have been involved in diverse projects that benefit health sciences librarians and the Latinx community. In 2023, the Latinx Caucus deservedly received the Caucus Project of the Year Award for their *Hispanic/Latinx Inclusive Terminologies Project*, where the caucus addressed a need to review terminology and capture the diversity of the Hispanic/Latinx populations in the United States. The award serves as a vehicle to highlight collaboration and innovation amongst health sciences librarians [8].

Latinx Caucus members have been successful in collaborating on projects with other MLA members and caucuses, as well. These initiatives include Covid-19 Spanish Language Resources, a guide for health

professionals, patients, and the public; Hispanic/Latinx MESH Terms, recommendations for changes to the current terminology related to the Hispanic/Latinx populations; and recommendations for devising Hispanic/Latinx Search Hedges for optimal search results while searching the biomedical and health literature [7]. Currently, the Latinx Caucus works via various task forces to address programming, member engagement, outreach, research, and scholarship. Its long-term goals involve expanding BIPOC representation in the field of health/medical librarianship, increasing opportunities for caucus engagement, and forming bridges with library colleagues across Latin America.

Social Justice and Health Disparities Caucus

The Social Justice and Health Disparities (SJHP) Caucus has made many contributions to MLA's DEI and social justice initiatives over the past 25 years, building on efforts that began more than 50 years ago. Its origins can be traced back to 1972, when Jerome S. Rauch of the University of Pennsylvania and other MLA members submitted a petition to form a "Relevancy Group," later known as the Relevant Issues Section of MLA [9]. Its purpose was, "to promote the educational, scientific, and professional growth of its members with emphasis on social issues" [10].

In its early years, SJHP's "Relevant Issues Section Bibliographies" columns published in *MLA News* served as an important vehicle to inform MLA members about developing social issues and trends that could impact their professional lives, including occupational health (1985), hospice care (1987), treatment of HIV/AIDS patients (1989), workforce diversity (1991), alternative medicine (1995), and advance directives (1997). The group has collaborated with allied groups such as the LGBTQIA+ and Health Disparities Caucuses to offer programs at MLA annual meetings and sponsored timely MLA resolutions on social issues including the medical consequences of nuclear war (1983), anti-Apartheid efforts in South Africa (1986), AIDS (1987), addressing the health care needs of vulnerable populations (1997), and global violence (1996) [9].

In 2018, the Relevant Issues Section was renamed the "Social Justice Caucus" and its primary concern became "social justice issues that have an impact on how health sciences librarians perform their roles" [9]. Two years later, the Social Justice Caucus merged with the Health Disparities Caucus to become the "Social Justice and Health Disparities Caucus" [9]. The purpose was to promote, "the educational, scientific, and professional growth of its members with emphasis on social issues that have an impact on how biomedical librarians perform their roles," and to, "serve as a resource for MLA members related to health disparities and health inequities, promote awareness of literature and data related to social justice and health disparities, and identify

collaboration for education and programming to other MLA caucuses" [11].

In June 2020, the Social Justice and Health Disparities caucus continued to demonstrate its nearly half-century commitment to social justice and DEI initiatives by issuing a statement of solidarity with the efforts of Black Lives Matter movement protesters in response to the murder of George Floyd and to the continued police violence towards Black Americans, which the caucus identified as, "one of the many detrimental health disparities our caucus organizes to address" [12].

Journal of the Medical Library Association's (JMLA) Equity Advisory Group

Partially as a result of events surrounding George Floyd's murder in 2020, *JMLA* created an Equity Advisory Group (EAG) to examine ways of better incorporating DEI into its policies, procedures, and practices. The EAG strives to provide more opportunities for members of the Black, Indigenous, and people of color (BIPOC) community; LGBTQIA+ community; and for people with accessibility needs to serve as authors, reviewers, and editorial team members. Since the EAG was formed, *JMLA* has examined a range of existing, structural challenges in adopting DEI-informed practices, including how to respond to a racist incident involving one of *JMLA*'s copy editors in 2020, and academic integrity concerns regarding a section editor in 2023.

Since 2020, the EAG has engaged in projects such as increasing diversity among the editorial board; revising the editorial style guide to be more inclusive; creating a name change policy for previously-published *JMLA* authors who want to change how their name appears; developing a DEI training program for the editorial board and reviewers; and other initiatives including gathering DEI-related demographic data for editorial board members, reviewers, and authors.

The EAG will conduct a DEI survey of reviewers in 2024 in order to improve recruitment of authors from historically marginalized communities. Other future projects will include developing a first-time author mentoring program and improving article submission, editorial workflows, and other accessibility-related aspects of the publication process.

MLA Reads Virtual Book Discussion Group

The MLA Reads Virtual Book Discussion Program grew from "Transforming Libraries Using Implicit Bias Training," a special content session held at the MLA 2018 Annual Meeting. In that original session, participants conveyed the need for safe spaces to gain knowledge, converse with others, and to confront the implications of biases on their work and personal lives. Shannon Jones and Kelsa Bartley, original organizers of the 2018 special content session, planned and facilitated the first virtual

book discussion for approximately fifty librarians on the topic of implicit bias, using Mahzarin R. Banaji and Anthony G. Greenwald's book, *Blindspot: Hidden Biases of Good People*, as a platform for safe and thought-provoking interactions for discussion on challenging issues and topics in a safe, welcoming, and inclusive environment [5].

The MLA Reads program is now in its 6th year; member facilitators have led over 700 members of MLA and other non-member librarians across the country through important conversations in safe, virtual spaces, about a wide range of topics related to diversity, equity, inclusion, and ability. The program has inspired offshoots, such as the AAMLA Reads discussions facilitated by the African American Medical Librarians Alliance Caucus (AAMLA) and the AAHSL Reads Virtual Book Club facilitated by the Association of Academic Health Science Libraries (AAHSL) DEI Committee. Facilitators Shannon Jones, Kelsa Bartley, Melissa DeSantis, Ryan Harris, Don Jason, and Dede Rios also wrote a book chapter highlighting the importance of having conversations about DEI and ability in libraries; providing details on how and why Banaji and Greenwald's book was used to discuss the topic of implicit biases and the harms they can cause; and how the book discussion program became a catalyst to advance discussion of difficult topics. The chapter provides details about discussion group organization and logistics, facilitator training, how the program is evaluated for improvements, and lessons learned during the course of the program's existence [13].

LOOKING TO THE FUTURE

While much progress has been made in the area of DEI within MLA, there is still much to do. The library profession as a whole is predominantly white and female, and these tendencies are no different in medical librarianship. Diversification of the profession, which includes recruitment and retention of people from historically marginalized communities, needs to be a major priority for both the profession and for MLA. Representation matters. We need to continue our self-examination of our policies, attitudes, and goals to be more diverse, inclusive, and equitable. While we need to look back and understand our history and how it has negatively affected our colleagues from diverse backgrounds, we also need to look forward to how we build a better MLA that truly values and includes all voices.

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Welcome to the future: challenges and opportunities discussed in the Vision 2048 Task Force Open Forums 2021-2023

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INTRODUCTION

What will librarianship look like in the future? This question is on the minds of health sciences librarians as our landscape of professional practice continually changes. As the Medical Library Association approaches its 125th anniversary, how can we build upon our rich past to build a better, more inclusive future? In 2020, the MLA Board of Directors transformed this question into a goal in the Association's strategic plan and appointed four task forces to address it. One of those, the Vision 2048 Task Force, was charged with engaging the MLA membership in a discussion of future profession in 2048. This article documents the work of the task force, the challenges that emerged in the various discussions, and opportunities for the association to consider as we move forward toward 2048 and beyond.

THE VISION 2048 TASK FORCE

Charge

The Vision 2048 Task Force is one of four task forces associated with MLA's Building a Better Future strategic goal. Its charge was, "to envision the future (25 years) of the profession with community-driven activities and ideation that reflects the richness of MLA communities" [1]. The task force met this goal by collaborating with MLA Caucuses, MLA editorial boards, and MLA headquarters to ensure broad participation in activities and discussions that engage perspectives from across the association.

Membership

The goal of the task force was to have a diverse membership which reflected various perspectives within MLA. Members of the task force included one liaison from the Board of Directors to facilitate communication between the task force and MLA leadership, one member of MLA staff for project management purposes, a handful of volunteers who answered an open call through

community council, and additional members with specific areas of expertise. Like the other 125th taskforces this one was appointed by the MLA president Lisa Traditi. The task force met monthly from June 2021 until early 2024.

Early on, the task force chair recognized that library school students were missing in the process. After a call for volunteers to include library school student perspectives, six students expressed interest to potentially serve on the task force. As the chair did not want the task force to grow too large, but still wanted students to be included in this initiative, the Vision 2048 Student Workgroup was formed. The goal of this workgroup was to serve as a focus group of library school students on library student specific challenges, issues, and concerns. To ensure the perspectives of this work group were incorporated into the main task force discussions and initiatives, two members of the workgroup were selected to serve on the main task force as liaisons. The group was facilitated by M.J. Tooley who was also a member of the main task force. All together the Vision 2048 Task Force and Vision 2048 Student Work Group consisted of 19 members: 15 librarians and 6 students.

Meetings & Initiatives

The task force met monthly beginning in June 2021 to identify ways to engage MLA members. Ideas included doing an environmental scan, surveying MLA members and non-members, and conducting focus groups. After assessing the bandwidth of the task force members, the task force decided to host a series of town halls to get feedback from large groups of people at once. Most of the task force work then became dedicated to planning and hosting these town halls and evaluating information gained from them. This article summarizes the themes identified in these discussions and our recommendations to MLA based on those themes.

THE VISION 2048 TOWN HALLS

Between 2021 and 2023, the Task Force hosted four town hall discussions, three with MLA members and one with library school students. The town halls were facilitated by members of the task force and current or past chairs of MLA caucuses. In keeping with MLA's strategic plan, MLA President Shannon Jones charged the task force with weaving Diversity, Equity, and Inclusion (DEI) into all of the open forum topics.

Town Halls for MLA Members

Two of the town halls for members were held online and one in person at MLA 2022 in New Orleans. Each of the online town halls had around 100 attendees and the in person had just above thirty participants. Each event opened with a brief introduction followed by breakout groups focused on topics selected by the Task Force. The discussions in the breakout groups were facilitated by members of the task force or current/former MLA caucus leaders that were selected by the task force chair. The caucus chairs were selected based on expertise in relation to the topic they would facilitate. These topics covered all aspects of health sciences librarianship:

- Leadership and Management
- Clinical Outreach/Hospital Librarianship
- Community Engagement & Outreach
- Curricular Involvement
- Technical Services
- Collection Management
- Data Management and Digital Curation
- Reference & Consultation
- Research & Publication
- Educating Health Care Professionals
- Educating Future Health Information Professionals
- Web and UX (User Experience) Design
- Future Roles
- Healthy Work Environments
- Professional Library Associations
- Miscellaneous

Attendees at the virtual forums could share their thoughts verbally or via Zoom chat. Each session concluded with breakout groups reporting the results of their discussions to all attendees. Immediately after each session, facilitators sent notes and highlights from their discussions to the task force chair. This information informed discussions at subsequent Task Force meetings. Attendees also had the

option of emailing the task force chair to share additional feedback after the town halls concluded.

Town Hall for Students

In November 2022, the student work group hosted a virtual town hall for library school students. The session was open to MLA members and non-members and advertised to the MLA New Members Caucus and via library school email lists. This session consisted of a single large-group discussion rather than breakout sessions with around 40 attendees which included current library school students, members of the task force, and experienced librarians who came to hear the perspective of the students in attendance. Although participants were invited to share their thoughts verbally, most participated via Zoom chat. The chat transcript served as notes for the session. Some students also sent additional comments to the task force chair after the session.

TASK FORCE FINDINGS

Overarching Theme: Building a Better Future Through Centering the Needs of the Communities We Serve

As the task force analyzed feedback from these open forums, several themes emerged as important to MLA members. The largest of these themes was the importance of centering the needs of the communities health information professionals serve and adapting professional practice as the needs of these communities change. The undercurrent of constant change was ever-present throughout forum conversations in a variety of ways. Examples include the need for training and professional development for library professionals to gain new skills/competencies, preparing library school students for future practice in health sciences librarianship, advocating for the value librarians provide in academic and clinical environments, and adapting to changes in scholarly publishing and collection development.

The demographics of our communities are also changing, accelerating the importance of DEI principles in all areas of library practice. To build a strong future, we must include and engage a variety of perspectives. In her 2018 presidential address as the first Black president of the Medical Library Association, Beverly Murphy called MLA members to action by stating,

Diversity drives excellence and makes us smarter, especially when we welcome it into our lives, our libraries, and our profession. And we are smart. The diversity of our staff and our organization is important and it's necessary to help us survive and thrive in this journey. The melding of many different minds and thoughts, activities, feelings, and interactions produces a plethora of healthy, productive experiences that we all can gain from if we remain open and flexible. [2]

The rest of this article will document the sub-themes discussed in the open forums through the lens of challenges and opportunities MLA should consider to ensure that the membership is equipped to thrive in the next 25 years and beyond.

Challenges and Opportunities

Recruiting the Next Generation of Health Sciences Librarians

The task force sought feedback on recruiting future health sciences librarians from current MLA members and from current library school students and recent graduates. One of the ways this was done was through the student town hall held in November 2022 which was mentioned earlier in this article. Participants identified challenges that begin before library school and continue during library school and after graduation.

Before Library School

Low salaries and limited budgets are a challenge for recruiting into the library profession generally, including health sciences librarianship. Many other professions that require graduate degrees pay more than librarianship. Further, many health sciences library positions are with nonprofit or public sector employers, which generally pay less than private sector employers.

Health sciences librarianship also suffers from a lack of visibility; most non-librarians are unaware that our profession exists. Many suggestions from MLA members are aimed at addressing this lack of visibility. Members suggested the need for programs aimed at K-12 and undergraduate students to expose them to medical librarianship. Specific suggestions included developing pipeline programs, creating tool kits for high school and undergraduate curricula, including medical librarianship in STEM outreach programs, and creating programs similar to the [First Look Program from AMLA](#) to expose undergraduates to our field. Some participants also mentioned creating programs to recruit non-librarian professionals (e.g., practicing health professionals) into health sciences librarianship.

During Library School

The overall lack of consistent inclusion of specializations and health sciences librarianship training within graduate library education is among the greatest challenges facing health sciences libraries, health sciences librarianship, and the Medical Library Association (MLA.) These challenges were mentioned numerous times both in the general town halls and in the town hall for students.

Many Master of Library and Information Studies students are unaware of health sciences librarianship, some students think one must have an academic background in the health sciences to be a health sciences librarian. Many

programs lack robust health sciences tracks or other means of exposing students to our profession. There is a general lack of knowledge regarding which library and information schools offer coursework, let alone tracks, in health sciences librarianship. While many schools promote courses or a specialization in health sciences librarianship, classes may be offered irregularly or qualified faculty to teach the courses. The MLA [Professional Recruitment and Retention Committee](#) (PRRC) maintains a list of library schools offering health sciences courses but does not verify whether or how often the courses are actually offered.

Basic core classes and competencies in health sciences librarianship are also not defined. Introductory courses defining and explaining the health sciences library environments—academic, hospital, special—are not provided nor are courses regarding useful skill sets and practical needs. MLA is developing a set of core competencies and a curriculum. It is unclear how this curriculum will be shared with library schools or if individuals will need to pursue these competencies outside of library education.

Many town hall participants agreed that the best learning experiences come through practicums, internships, or fellowships, but they may be out of reach for students with limited financial means or the mobility to travel to remote locations for limited experiences. Most of these opportunities offer course credit in lieu of salary, and course credit does not pay for living expenses. Some participants mentioned that they need to work to survive while enrolled in graduate school, so unpaid opportunities would not be an option. Some internships do offer financial support but often require students to relocate, adding to the burden of travel costs, potentially additional rent, and increased cost of living. Online experiences are available, especially since the pandemic, and are particularly valuable to part-time or working students. Online opportunities are more effective in some areas and may not offer direct interactions with other library staff or users. Shadowing library staff is another learning option for library school students depending on geographic proximity and opportunity.

Not everything can be learned in library school, so how do we prepare students for diverse opportunities and changing environments? In the general town halls, experienced librarians admitted frustration with library schools and indicated that most training occurs once a new librarian is hired. This necessitates investment in time and training but allows the new librarian to acclimate to the work environment and its needs. Professional associations such as MLA can help to “skill up” librarians with programs such as the Research Training Institute (RTI), multi-level continuing education courses (e.g., the systematic review specialization courses), and exposure to new and emerging specializations such as data science/visualization, health informatics, working with

the research enterprise, or artificial intelligence. Many of these programs are not free and must be funded by either the individual librarian or their employer.

Recommendations from town hall participants fell into two categories. One is building relationships with library schools and strengthening health sciences curricula and learning opportunities within them. The second is building a strong student or new professional group within MLA. Both recommendations require effort and support from MLA.

Participants recommended that MLA build relationships with library schools and the [Association for Library and Information Science Education \(ALISE\)](#) to increase exposure to health sciences librarianship and support robust educational opportunities in the discipline.

Participants suggested MLA should:

- Verify that health sciences courses advertised by library schools are robust and truly exist. MLA could maintain a clearinghouse of these programs and promote them, similar to a seal of approval.
- Host a summit for library schools who support health sciences librarianship education to discuss issues and needs. This would also be an excellent opportunity to introduce the new MLA curriculum and competencies and build partnerships. There may also be an opportunity for MLA to license this curriculum to library schools.

Ideas for a curriculum supporting health sciences librarianship include a two-part course on the health sciences library environment. Part one would take a deep dive into the types of health sciences libraries including academic, hospital, consumer health, federal, or pharmaceutical. The pivotal role of the National Library of Medicine (NLM) would be included, providing a segue into the second part. The second part would focus on practical knowledge and skills such as Medical Subject Headings, data structures, systematic reviews, cultural competency, and Health Insurance Portability and Accountability Act/privacy regulations. Participants also recommended a library marketing, planning and advocacy course that included promoting expertise, relevance and impact along with strategic planning and alignment. Other ideas included user interactions/customer service, teaching/training, information/knowledge management, writing and communications (including National Institutes of Health biosketches and grants), and soft skills such as collaboration and interpersonal communication to support effective team collaboration and integration into institutional programs. While many of these topics are general and essential in all types of libraries, frequently there are nuances in the health sciences environment that need to be addressed. These could also become continuing

education credits or special webinars of interest to MLA members and others. Below are a few ways the Student Town Hall participants suggested MLA could do to support students:

- Maintain a clearinghouse of practicum, fellowship, or internship opportunities enabling members to post options and students to find them.
- Offer reduced student rates for continuing education and student scholarships to attend the annual meeting.
- Establish a student caucus and promote it to library schools along with other benefits for students.
- Offer course(s) in library school curricula, including the Research Training Institute.
- Develop an MLA course designed to help students secure their first professional position. It could include resume writing, interviewing, a panel of new librarians, and a panel of potential employers sharing what they look for in candidates.
- Co-host events with library schools.
- Encourage health sciences libraries to offer paid internships and advertise positions – with salary information – at library schools.

One discussion point that seemed to resonate in all the town halls was whether professional associations were still relevant. In libraries as well as in library schools, there are so many options for learning and professional engagement both connected and unconnected to professional associations. One other challenge reported by experienced health sciences librarians in the discussion groups was a gap in necessary skills in recent graduates who apply for librarian roles. For example, if applicants are not familiar with resources heavily used in the clinical setting, they may struggle in a hospital/clinical librarian role. Since MLA specializes in health sciences librarianship, it could serve as a place to help librarians develop the competencies needed to be successful in the health sciences, benefiting both new librarians and institutions hiring them. While many of the recommendations for graduate library education suggest and even require forceful commitment from MLA, devoting effort to the next generation of health sciences librarians and ensuring new librarians choose MLA as their professional home might be worth it.

After Library School – Entry into the Profession

Town hall participants also made suggestions for recruiting and supporting new librarians. Challenges for new librarians that could be addressed by MLA include the cost of membership, Academy of Health Information

Professionals (AHIP) certification, continuing education courses, and conference attendance; the need for networking and mentoring opportunities; and the need for practical training focused on professional competencies such as the MLA Competencies for Lifelong Learning and Professional Success [3]. Training from MLA could also cover more general career competencies such as interviewing, negotiating job offers, avoiding toxic work environments, avoiding apathy and burnout, emotional intelligence, navigating hierarchies, critical thinking, communication skills, professional ethics, medical terminology, functioning as a solo librarian, orientation to higher education, demonstrating impact, and dismantling white supremacy in libraries, universities, and hospitals. Challenges that could be addressed by practicing health sciences librarians include creating job descriptions with language that is welcoming to new graduates, reconsidering experience requirements, assessing institutional procedures such as requiring employees to front expenses for professional development and wait to be reimbursed, and creating pathways for librarians in other areas of the profession to move into health sciences librarianship.

Members cited several issues related to DEI that impact the recruitment of health sciences librarians. These included: the need to make DEI information unified and findable on organization websites; barriers to accessibility created by outdated infrastructure and confusing policies and procedures; the need for affinity groups and mentoring based around shared identities increase belonging; the lack of DEI infrastructure for recruitment in hospital libraries; the need for baseline demographic data for LIS programs; and the ability for health sciences librarians to express their identities and bring their full, authentic selves to work.

Changes In How People Find and Use Information

During the townhall discussions, members noted that changes in sociocultural, political, and technological landscapes continue to impact the way people find and use information. These changes are already being felt in library practice and members shared both challenges and opportunities with the task force.

Library Collection Composition

While the last two decades have seen the normalization of electronic resources, with scholarly journals and databases dominating the collection budgets of health sciences libraries, the next two decades are primed to see additional changes. Facilitating access to media – from video content to digital education tools like UWorld for medical school board preparation– continues to pose challenges for libraries as these tools strain budgets and the technical capabilities of our institutions.

Though physical collections shrank throughout the 2000s and 2010s, members reported increased scrutiny of

physical space in light of changes to work and school life as a result of the COVID-19 pandemic. Libraries are being increasingly pressured to reduce physical collection (and even staff) footprints in favor of other uses, such as study space or for initiatives outside of the library. At the same time, there is increased patron use of mobile technology to access scholarly resources, which poses accessibility and usability challenges that library staff are often ill-trained or, in the case of vendor platforms, unable to address.

Purchasing and Licensing of Resources

Town hall attendees also discussed how libraries purchase materials. In the last three decades, library purchasing has shifted from one-time purchases of physical materials to subscriptions to electronic resources. As a result, libraries no longer own most of their collections, which in turn creates a cascade of concerns that include the inability to guarantee access (now or in the future), limited budget flexibility, and increased difficulty in explaining the return on investment for library resources. Coupled with straining budgets at universities and hospitals, libraries are limited in their ability to cultivate a collection responsive to user needs. Participants noted that members are asking MLA and other professional organizations for help negotiating with vendors and developing policies and best practices for licensing, ownership, and long-term access to library collections.

Members expressed concern at the sheer volume of publications being generated and the expectation of having access to all of them. More than just a budgetary problem, this growth in scholarly publications intersects with continued reductions in staff time for collection management work, leading to questions of quality vs quantity in acquisition decisions. While MLA cannot directly create more positions or staff time, it could potentially help members by evaluating new resources and/or providing a framework for doing so.

Data and Artificial Intelligence (AI) Tools in Library Collections

Members also discussed, with mixed feelings, the role of the library in providing access to and preservation of various types of data including data sets. Some viewed it as an area where librarians are well suited to use their expertise to fill needed roles in this field, while others expressed concerns related to lack of training and institutional resources to adequately support management of these types of collections/services. It would be a strain to consider this an emerging topic, as it has been a focus of NLM for at least a decade, but it remains an area that health sciences librarians are likely to seek out training and ideation about from MLA. During the town halls members also mentioned AI as a potential area for exploration. As AI - generative and otherwise - continues to emerge, members will undoubtedly be facing a slew of new financial and ethical challenges with the expectations of home institutions and patrons. At the time of these

town halls, this was largely a future concern, but as is evidenced at the time of publication, change in this space is happening faster than anticipated.

Changes in Needed Librarian Expertise

Members of the library team which includes both those with and without library degrees are taking on new roles requiring new expertise. Members anticipate the library taking on responsibility for additional parts of the scholarly communication and data management workflows, including developing repositories for and facilitating paid access to datasets where additional training opportunities are needed.

Factors that Impact the Use of Information

Two factors impacting the use of information were at the forefront of town hall discussions: information overload and information literacy. As research and practice continue to become more interdisciplinary, and with the aforementioned increases in scholarship being published, there are very real risks of overload for even the most focused of patrons. To address information overload, librarians will need to carefully curate resources and make explicit connections between curricula, research, and library resources – something that MLA advocacy could help with. What this advocacy might look like will surely change over time, but two concrete examples include providing talking points for health sciences librarians to use when working with their parent institutions (variations for type of parent institution are vital) and working more closely with related professional associations to ensure staffed, funded health sciences libraries are a priority in accreditation and best practices.

Regarding information literacy, concerns are multifaceted. Librarians need to be better trained in teaching skills so that gaps can be addressed more effectively – and one-shot instruction sessions remain a thorn in the side of many instruction librarians. Members are noticing changes in the information-seeking behavior of those they work with. These changes are partly driven by deficits in information literacy, leading individuals to prematurely end searches or settle for information on a topic instead of striving to find the best or highest quality information to fulfill their needs. Moreover, individuals tend to seek out a singular answer to their questions rather than adopting a more comprehensive approach. These challenges are ones that librarians are well-equipped to tackle. Members also suggested that a more thorough adoption of the Framework for Information Literacy for Higher Education developed by the [Association of College and Research Libraries \(ACRL\)](#) may be a stepping stone on this path.

Impact of the Changing Political and Social Landscape on Information Use

There remain considerable political risks for health sciences librarians, particularly in the United States where some political activists are fighting to limit access to

information on topics such as abortion, DEI/antiracism, and gender identity. Members noted the importance of advocacy from MLA and ALA to ensure access to information on topics around sexual orientation, gender identity, and sex education more broadly and that library workers remain protected. Climate change is another topic entrenched in political challenges that will become increasingly vital for health sciences librarians to address. From infrastructure stability to making connections between changing climates and health, information workers are going to play vital roles in the coming decades.

During the town halls, members noted the increased pressures librarianship is facing in this era of misinformation and disinformation and that there may be a need for us to take on the task of providing additional training in information literacy. This concern was at the forefront in 2023 when Michelle Kraft explored the long history of "fake news" and the role of health sciences librarians in addressing it during her Janet Doe Lecture [4]. In addition to concern about bad actors in the information landscape, members also noted the emergence of generative AI and its potential to impact the information professions. In addition to the intellectual property, environmental, and labor concerns this technology brings with it, there is also great risk to the accuracy of information. These tools can generate false claims, citations, and worse. Members are seeking guidance and opportunities to better understand this technology, not only for its downfalls but for potential upsides as well including where librarians can partner with designers of AI tools to ensure accurate information is disseminated and shared.

Retaining the Library Workforce

Work-Life Balance and Burnout

Town hall participants shared their thoughts on how health sciences libraries can best retain their staff, especially considering new work norms driven by the COVID-19 pandemic. Participants offered suggestions for library leaders, most focused on addressing the emotional well-being of librarians to improve retention.

In particular, members acknowledged that institutional policies, often rooted in traditional management philosophies prioritizing physical presence, may contribute to burnout and hurt retention efforts. Policies, procedures, and workplace norms must allow for all staff to be heard and included. To create this inclusive approach, participants suggested that leaders must develop a culture of open communication in which library staff feel safe and comfortable discussing their workloads, challenges, and concerns. Staff need multiple venues to communicate with leaders and managers as well as other library colleagues to address issues before they become serious problems.

To encourage work-life balance, participants suggested that medical libraries should implement flexible schedules, including compressed workweeks and/or flexible work hours, enabling librarians to meet both work and personal responsibilities. Libraries should also permit remote or hybrid work. Managers will need to balance the library's operational needs with the individual needs of their staff.

While flexible schedules focus on individual needs, managers also need to build cohesive teams. Participants agreed that team building is critical in reducing burnout. For medical librarians, collaboration within the discipline and with other disciplines is key. Establishing these connections can help mitigate loneliness and isolation, making individuals more resilient as they mutually support one another to address issues or meet the needs of the library. Enhancing team dynamics creates a positive work environment, reducing stress and burnout.

Additionally, participants agreed that managers should help librarians navigate this new work environment where physical presence is not always required. Remote/hybrid work arrangements can blur the boundaries between work and personal time, leading to increased stress and a heightened risk of burnout. Managers must collaborate with library staff in establishing norms for remote/hybrid work and teamwork. These norms should emphasize the importance of creating clear personal boundaries to maintain mental health, allowing time for personal pursuits and meaningful connections.

Participants shared that regardless of the steps taken, there will be times when librarians may feel overwhelmed, anxious, and unable to deal with their work, personal responsibilities, or both. It is key for managers to foster an environment where people understand that it is okay not to be okay and to ask for help. Leaders could offer opportunities for library staff to learn strategies to deal with stress, anxiety, setting boundaries, and other ways to cope or address the pressures of work while achieving work-life balance. Leaders should also ensure that staff are aware of employee assistance programs (EAPs) and know how to use them to get professional help when needed. MLA can help foster retention by providing courses, workshops, and other programming to help leaders and managers create healthy, supportive work environments. Potential topics include:

- building cohesive teams in a remote or hybrid environment
- improving emotional well-being
- promoting work-life balance
- clearly communicating role expectations
- conflict resolution

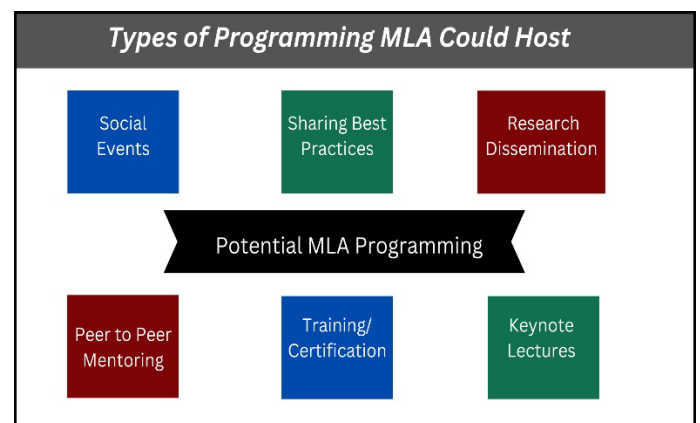
The Importance of Defining Roles & Boundaries

One other major topic discussed in relation to burnout was the ever-increasing duties and responsibilities assigned to librarians. Participants reported pressure from institutional leaders to prove the library's value. As a result, librarians may agree to take on new responsibilities and skills without letting go of other work, leading to overstretched and overwhelmed teams. Librarians from communities historically excluded from librarianship reported feeling burnout due to being volunteered without consent to serve on institutional committees and initiatives related to diversity. Many times, these initiatives are labor intensive and not related to their expertise, forcing them to do more work than their white colleagues. Town hall participants talked about the importance of library leaders being able to set boundaries and that MLA may be able to help by providing training and education in this area.

PROFESSIONAL DEVELOPMENT IN THE FUTURE

For current and future librarians to adapt to changes noted in the town hall discussions, professional development must exist to not only support the present changes but to prepare for the future ones as well. When discussing professional development, two main themes emerged within these conversations which include the role of professional organizations such as the Medical Library Association as well as the role of individual professional development activities such as training and certification courses. Figure 1 presents types of programming MLA could do to support librarians' development.

Figure 1 Programming MLA could host virtually and in person



Importance of Virtual Professional Development

Institutional funding is a key factor influencing the ways people engage in professional development. Participants in the member and student town halls were hesitant about spending substantial amounts of personal money on their

professional development especially if there was not an immediate benefit to their career progression. With the pandemic, virtual options for professional development—webinars, certification courses, and virtual conferences—became an option for librarians to develop new expertise without travel costs. During the discussions, members encouraged MLA to explore and expand virtual training opportunities.

The Importance of In-Person Professional Development

Despite a desire for continued options for virtual professional development options, members also indicated that in-person professional development is still valuable. The importance of the spontaneous human interaction that happens at an in-person conference or workshop was acknowledged to be difficult to replicate online. The collaboration through conversations and socialization happening in between sessions, at meals, or at social events can forge new relationships; these relationships can lead to collaborations and peer-to-peer support, which are invaluable to not only career development but also overall well-being that helps to minimize burnout. Participants talked about how just knowing someone else is going through the same thing can help with the mental load that comes with librarianship. This is especially true for librarians who are the sole person in their library from a historically excluded community; they may feel isolated with no one else representing the needs of their community. Having a place where they can come to physically connect helps them to find their professional home in a community of peers with similar life experiences. Members also noted that those in solo librarian roles also benefit from in-person connections.

Town hall participants noted the biggest challenge with these activities is the increasing costs associated with travel and registration. Those participants who had experience planning conferences shared how the costs of putting on an event are only increasing, which then drives up the cost of registration. Some suggestions for minimizing costs included encouraging vendors to fund more meeting grants, hosting events in smaller cities, and partnering with other organizations to have joint conferences. Members also suggested examining the frequency of large-scale meetings to alternate with other large library meetings such as ACRL. In addition to examining the structure of conferences, MLA should prioritize content that allows for one-on-one engagement between members. The focus of conferences should be on relationship-building and problem-solving in real time. Presentations could be recorded and shared virtually so that in-person time is focused on human interaction.

Importance of Advocacy & Partnerships

Participants in the town halls discussed the importance of partnerships outside of the library, including with other departments, university and clinical faculty, university and clinical administration, and community partners. How the library is perceived by these partners often has a direct impact on how the library functions within the institution and the impact it can have on members of their community.

As noted earlier, institutional policies have a large impact on the well-being of employees. Sometimes library workers, even library administrators, have very little say in the drafting and implementation of these policies and procedures. Town hall participants noted that MLA could provide a space for leaders to connect to one another to learn how to work with institutional partners to advocate for the library and include library professionals in decision making.

Participants also recommended that MLA leadership forge partnerships and collaborations with leaders at change-making organizations whose educational, research, or clinical missions align with MLA, its values, and the work of its members. Advocacy and partnerships were identified as vital components for hospital librarians as many hospital libraries close due to budget cuts.

Role of Hospital Librarians in Clinical Care

During the town hall discussions, concerns from hospital librarians were woven throughout various discussions from advocacy to collaborating with academic librarians in educating the next generation of health care professionals. Members mentioned that not all hospital librarians work in an academic healthcare setting. While there is much overlap between academic and hospital librarianship, there are some differences to consider. Most academic settings have multiple librarians but there are numerous non-teaching hospitals who may employ only one librarian to provide library services, in many cases for multiple clinical locations. Participants discussed the need for increasing programs leveraging the interdisciplinary and multidisciplinary opportunities of hospital librarianship. MLA would do well to offer programs supporting this smaller membership subset. While hospital librarians want to volunteer for a variety of MLA roles and programs, hospitals often limit access to websites and do not provide institutional funding for activities not directly related to one's employment. These librarians are eager to secure funds for continuing education and attending local, regional, and national meetings so they can network with experts and colleagues and apply new knowledge to library programs and services. Hospital librarians feel pressure to demonstrate their value to hospital programs and services in education, patient care, and research.

Participants suggested that MLA continue expanding virtual meeting options, support technical accessibility, understand the trends in hospital financial structures and their impact on hospital librarians and their respective service areas, consider removing silos between academic and hospital librarians, and engage all types of medical librarians in association activities.

CONCLUSION

Through these town halls, the Vision 2048 task force was able to engage with the membership to identify future challenges and opportunities for MLA. Through the conversations at the town halls and task force meetings, it was evident that MLA has a passionate and engaged membership invested in the future of health sciences librarianship. Together, members and association leadership can use the challenges and opportunities identified in town hall discussions to inspire future conversations and initiatives that support health sciences librarians and the communities we serve.

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Twenty-five years of Medical Library Association competencies and communities

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Professional associations provide resources to support members' career development and facilitate ways for members to engage with and learn from one another. This article describes Medical Library Association (MLA) activities related to the revision of professional competencies and the restructuring of the organization's communities during the past twenty-five years. Grounded in MLA's Platform for Change, the MLA competency statement underwent two revisions with core themes remaining consistent. Major efforts went into rethinking the structure of MLA communities, and it became a strategic goal of the association. Numerous groups spent considerable time guiding the changes in MLA's community structure. Sections and special interest groups were transformed into caucuses. Domain hubs were established to facilitate project coordination across caucuses and create more leadership opportunities for MLA members, but their implementation did not meet expectations. Member engagement and leadership are ongoing challenges for MLA. The next twenty-five years will undoubtedly see additional revisions to the competencies and continued iterations of the community structure.

Keywords: MLA competencies; Health Information Professionals; Medical Library Association; Organizational Change

INTRODUCTION

The 1990s saw widespread use of the World Wide Web, personal digital assistants (PDAs), and email to name a few technologies that allowed people to find and communicate information. Digitized library collections were new, as was Google, enabling easier access to information outside of the physical library. PubMed was launched in 1997, and electronic medical records systems were being developed, making biomedical and patient information more available. By the time the Medical Library Association (MLA) celebrated its 100th anniversary in 1998, it was apparent that health professionals' learning had to be fast-paced and continuous. Continuing education (CE) courses at the 1998 meeting included: Managing infoGLUT: Managing Too Much Electronic Information, Building and Managing Your Digital Library, Basic Web Page Design, and Consumer Health Information on the Internet. The MLA 1999 Annual Meeting was aptly themed "Present Tense, Future Perfect?" Since then, we have witnessed ongoing and significant changes in the information landscape – think Web 2.0, social media, smart phones, big data, rapidly emerging generative artificial intelligence (AI). Advances in molecular medicine, including genetic analyses, provide increased understanding of disease processes, enabling the development of more "personalized" medicine. Improved imaging technologies give 3D views of a patient's unique anatomy and physiology and can be invaluable in guiding surgical procedures. Many of these advances involve large sets of

data. Changes in the health care landscape naturally influence the necessary knowledge and skills we need as health information professionals.

Professional association activities, such as those established and supported by MLA, play a key role in ensuring their membership has the knowledge and skills to practice effectively now and in the future. In this article, we focus on MLA's professional competencies and the development of MLA communities. Defined professional competencies inform and guide the professional development activities of practitioners; MLA communities connect members with similar interests. MLA's competencies emphasize an individual's responsibility to seek opportunities to learn continuously and acquire skills needed as roles change. Competencies assist in reflection and self-assessment; professional communities facilitate communication among practitioners with similar roles and interests. These are aspects of more informal professional development. Changes in MLA's support for more structured, formal professional development opportunities, such as MEDLIB-ED and specialization certification, are discussed elsewhere in this issue.

The perspective shared in this article is from MLA members who participated in the development of MLA's 2017 *Competencies for Lifelong Learning and Success* (Hannigan and Philbrick) and different phases in the restructuring of MLA communities (Fulton, Ogawa, and Philbrick). Our purpose is to highlight the changes in the competencies for health sciences librarians and in the communities (focusing on the former Section Council,

which was comprised of representatives from sections and special interest groups) within MLA over the past 25 years. The processes in making these changes were not symbiotic, but the changes to the competencies did inform the process for changing the community structure within MLA. We acknowledge that the competencies and community structure will not remain static over time, with the processes to review and refine them being iterative and evolving.

EVOLUTION OF THE MLA PROFESSIONAL COMPETENCIES

At MLA's Centennial, Fred Roper reflected on MLA's longstanding commitment to professional development. He quoted Louise Darling, who said, on the occasion of MLA's 75th anniversary, "our Association has been talking about education, standards, and certification for most of its life." [1] *Platform for Change: the Educational Policy Statement of the Medical Library Association* responded to the "need for a clear and forward-looking statement of expectations for medical librarians and...an agenda for future action." [2] This report addressed the continuum of learning to support a medical librarian's competence and performance, including formal training and more informal opportunities. The authors identified graduate programs, MLA and other professional associations, the National Library of Medicine (NLM), employers, vendors, and publishers as sources of training, but stated that "the ultimate responsibility for lifelong learning and professional development rests with the individual." [2]

In 2007, the MLA Task Force on Educational Policy Statement Revision reviewed *Platform for Change*, acknowledging the dramatic change in the health and biosciences environment and the ubiquitous role of technology. Member input had been solicited at the MLA 2005 Annual Meeting, and the overall goal was to develop "an overall strategic statement of MLA's approach to education and professional development for its members in the future." [3] The Task Force released a new educational policy statement, *Competencies for Lifelong Learning and Professional Success: The Educational Policy Statement of the Medical Library Association*, identifying seven professional competency areas [3].

As in *Platform for Change*, the authors emphasized the individual's responsibility for professional development and the necessary support roles of MLA, employers, educators, and NLM. For example, recommendations for MLA indicated that "MLA must continue its leadership role in creating a vital and responsive professional development program and a dynamic set of coordinated education opportunities." [3] The scope of this report also went beyond competencies to include personal attributes such as "political savvy and negotiation acumen," "adaptability and flexibility," and "balance of personal and professional life."

Competency statements need to be updated to reflect the continuously changing nature of the health information environment and practitioners' roles. In 2017, MLA's Task Force to Review MLA's Competencies for Lifelong Learning and Professional Success issued its report including revised professional competencies [4]. During the time since the 2007 report, other professional organizations had issued competency statements, which informed the Task Force's work. The 2017 revision followed the practice that "competency statements define essential professional skills and abilities that can be observed, measured, and taught." [4] The Task Force held an open forum at the MLA 2015 Annual Meeting and distributed a survey to the entire MLA membership to solicit input to inform the revision. Multiple drafts of competency statements were reviewed by early career and experienced professionals, members of other associations, and the MLA Research Imperative Task Force. A project award from the National Network of Libraries of Medicine (NN/LM) Southeastern/Atlantic Region supported the revision of the competencies by handpicked MLA leaders and experts. Because technology had become so pervasive in our work, reference to technology skills was woven throughout the document rather than appearing as a standalone competency. Research skills were also emphasized, as was the broader role of health information professionals as educators. The resulting *Medical Library Association Competencies for Lifelong Learning and Professional Success, 2017* lists six competencies:

- Competency 1, Information Services: A health information professional locates, evaluates, synthesizes, and delivers authoritative information in response to biomedical and health inquiries.
- Competency 2, Information Management: A health information professional curates and makes accessible bioscience, clinical, and health information data, information, and knowledge.
- Competency 3, Instruction & Instructional Design: A health information professional educates others in the skills of bioscience, clinical, and health information literacy.
- Competency 4, Leadership & Management: A health information professional manages personnel, time, budget, facilities, and technology and leads others to define and meet institutional goals.
- Competency 5, Evidence-Based Practice & Research: A health information professional evaluates research studies, uses research to improve practice, conducts research, and communicates research results.

- **Competency 6, Health Information Professionalism:** A health information professional promotes the development of the health information professions and collaborates with other professionals to improve health care and access to health care information.

Structurally, each competency statement is followed by an explanation, performance indicators, and examples of basic and expert levels of performance. For example, Competency 2 addresses information management. The explanation, one of the performance indicators, and examples at both the basic and expert levels are given here:

- **Competency:** Competency 2, Information Management: A health information professional curates and makes accessible bioscience, clinical, and health information data, information, and knowledge.
- **Explanation:** Our strength is our ability to develop and organize collections tailored to specific audiences. In cataloging and classifying, including assigning metadata, we impose order to improve access. Traditionally, we have organized information resources into libraries, and personal records and artifacts into archives. Now, our expertise is being applied to organizing research data into collections that can be used electronically across institutions and countries. We know the value of and how to apply standards so that records of collections are universally comprehensible and enduring.
- **Example Performance Indicator:** Implements data management plans.
 - **Basic:** Describes the data life cycle; identifies and describes data resources, tools, and repositories; explains data plan requirements of funding agencies.
 - **Expert:** Conducts data curation interviews; develops and implements data management plans and policies; consults on managing data across the data life cycle.

The three versions of MLA’s professional competency statements are mapped in Table 1. Six common competency themes are found among the three, including information services, information management, instruction, management, research, and technology. Technology only appears in the 1992 and 2007 iterations, as technology was woven throughout the 2017 statement.

Table 1 Mapping of MLA competency statements

Competency Theme	1992	2007	2017
Information Services	Health Sciences Information Services: “Health sciences librarians require knowledge of the content of information resources and skills in using them”	“Understand the principles and practices related to providing information services to meet users’ needs”	Information Services: “A health information professional locates, evaluates, synthesizes, and delivers authoritative information in response to biomedical and health inquiries”
Information Management	Health Sciences Resource Management: “Health sciences librarians must know the theory of, as well as have skills in, identifying, collecting, evaluating, and organizing resources and developing and providing databases”	“Have the ability to manage health information resources in a broad range of formats”	Information Management: “A health information professional curates and makes accessible bioscience, clinical, and health information data, information, and knowledge”
Instruction	Instructional Support Systems: “Teaching ways to access, organize, and use information to solve problems is an essential and ever-widening responsibility of the health sciences librarian”	“Understand curricular design and instruction and have the ability to teach ways to access, organize and use information”	Instruction & Instructional Design: “A health information professional educates others in the skills of bioscience, clinical, and health information literacy”
Management	Management of Information Services: “Leadership in the application of library	“Know and understand the application of leadership, finance, communicati	Leadership & Management: “A health information professional manages personnel,

	and information science to the handling of health sciences information resources in complex institutional environments”	on, and management theory and techniques”	time, budget, facilities, and technology and leads others to define and meet institutional goals”
Research	Research, Analysis, and Interpretation: “[T]he health sciences librarian is called upon to apply knowledge, skills, and understanding” to conduct and interpret research	“Understand scientific research methods and have the ability to critically examine and filter research literature from many related disciplines”	Evidence-Based Practice & Research: “A health information professional evaluates research studies, uses research to improve practice, conducts research, and communicates research results”
Health Information Environments/Profession	Health Sciences Environment and Information Policies: “Health sciences librarians must understand the contexts in which the need for biomedical and related information emerges and the unique ways of perceiving and interpreting those environments”	“Understand the health sciences and health care environment and the policies, issues, and trends that impact that environment”	Health Information Professionalism: “A health information professional promotes the development of the health information professions and collaborates with other professionals to improve health care and access to health care information”
Technology	Information Systems and Technology: “Health sciences librarians must be able to understand and use technology and systems to	“Understand and use technology and systems to manage all forms of information”	Note: Not included as a standalone competency, but rather woven throughout the competencies listed above.

	manage all forms of information”		
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Over time, researchers have written about various aspects of competencies as they relate to health sciences librarians; the following are some examples.

In 2012, Philbrick conducted a Delphi study “to identify the professional and personal competencies that entry-level academic health sciences librarians should possess from the perspectives of academic health sciences library directors, library and information sciences (LIS) educators who specialize in educating health sciences librarians, and individuals who serve as both LIS adjunct faculty and practitioners in the field of health sciences librarianship.” [5] She found that, for the entry-level academic health sciences librarian, personal competencies are as important as professional competencies. Academic health sciences library directors emphasized the importance of teamwork, learning, integrity, motivation, flexibility, and communication [5].

Ma, Stahl, and Knotts conducted a scoping review to identify emerging roles of health sciences information professionals (HIP) to “inform library school students about expected entry-level job qualifications and faculty about adaptable changes to specialized HIP curricula.” [6] Nine categories of roles were identified, such as clinical and medical information provision, data management, research, and scholarly publishing. All emerging roles involved multiple MLA professional competencies.

Bass et al. focused on the competencies needed to develop skills in collection organization [7]. They reviewed formal and informal opportunities to develop those skills and found that communities of practice are important resources for people involved with cataloging and metadata. They advocated for the need for more formal and informal opportunities for librarians to develop and grow these skills.

The MLA professional competencies, along with researchers’ work in this area, have outlined the knowledge and skills required of health sciences librarians, and there is a continual need for health sciences librarians to stay current on the latest developments in the field. MLA’s community structure has provided a framework for MLA members to learn from each other, and its evolution is discussed in the subsequent sections.

EVOLUTION OF THE MLA COMMUNITY STRUCTURE

In June 1977, the MLA membership accepted the recommendations of the Ad Hoc Committee to Study MLA Group Structure, leading to the development of sections and Section Council [8]. Starting in 1980-81, the

main community structure of MLA consisted of sections (groups whose members paid dues to support the activities of the section and consisted of a specified number of members set by MLA) and special interest groups (SIGs, groups whose coalesce around emerging areas of interest, did not necessary have enough members or routinized leadership to be developed into a Section, and whose membership didn't require due), which fell under the umbrella of Section Council [9] (the governing body made up of elected representatives, whose task included approving or sunsetting the formation of Sections and SIGs, program planning, and supporting MLA initiatives). The following years allowed for examination of these community structure changes made in the early 1980s. There have been several groups who have examined those changes and made recommendations and/or took actions regarding MLA community structure over the last 25 years, as outlined in Table 2.

Table 2 Timeline of MLA community structure recommendations/actions (1998-present)

Years	MLA Group	Relevant Recommendations/ Actions
1999	Governance Task Force [10]	Reduce the size of Section Council by eliminating the underutilized position of alternate Implement a new structure of Section Council based on a representative-elect model Result: Implemented
2007	Section Council Composition Task Force [11]	Continue existence of Section Council and have it be composed of section chairs and immediate past section chairs instead of representatives from each section Result: Implemented
2009	Section Council Review of Section Programming Task Force [12]	Change from section-led programming for the annual meeting to a more general call for papers through Section Council Result: Implemented
2013-2014	MLA Futures Task Force [13]	Establish domains to define MLA's scope Streamline the organizational structure of MLA Result: Not implemented, but informed future task forces' work
2015-2016	MLA Strategic Priorities Task Force [14]	Reviewed section and SIG data for relevancy

		Developed relevance matrix for sections and SIGs Revised definitions of sections and SIGs
2016-2017	Rising Stars Cohort [15]	Create a metrics dashboard and standardized metrics form for Section Council Develop an automated system for sections to align their goals with MLA's strategic plan Improve visibility of sections' and SIGs' work on MLA's website Create a "SIG only" MLA membership with a nominal fee Encourage SIGs to host more activities online Result: Implemented system for aligning goals; Informed further MLA Board discussions and future task forces' work
2016-2019	Communities Strategic Goal Task Force [16]	Change sections and SIGs to caucuses (affinity groups in the document), Section Council changed to Community Council. Provide structure for communities to work together and connect with MLA programming/committees through communities of practice (eventually called domain hubs) Eliminate membership dues for sections to provide more access to participation Support the work of communities and hubs through MLA's annual budget Result: Recommendations received by Board, used to inform subsequent changes to bylaws, and served as outline for Communities Transition Team work.
2019-2020	Communities Transition Team [17]	Established caucuses Created policies governing caucuses, domain hubs, and Community Council Coordinated new budget model for communities with MLA Finance Committee Result: New community organizational structure established for MLA
2022-2023	Community Assessment Team [18]	Disband the domain hubs Result: Domain hubs disbanded May 2024.

In May 2016, the MLA Board of Directors approved a strategic goal focused on communities, which was intended to "[s]trengthen MLA's member communities (sections and SIGs) by analyzing and recommending community architecture and roles..."[19] This action was taken in response to the recommendations and

suggestions from three groups (Futures Task Force, Strategic Priorities Task Force, and 2016-2017 Rising Stars cohort) that sections, SIGs, and/or Section Council needed to change. The MLA Communities Strategic Goal Task Force (CSGTF) was charged with completing the work to fulfill the strategic goal.

CSGTF began their work with a review of the previous groups' reports. At the MLA 2017 Annual Meeting, CSGTF engaged Section Council in a discussion about the ideal roles of sections, SIGs, and Section Council and whether the current organizational structures enabled these roles. Section Council members unanimously agreed the current structure did not enable the ideal roles. Together, CSGTF and Section Council began developing an initial set of guiding principles for an effective community [20]. The guiding principles and consensus of Section Council were also presented to MLA members at an open forum on the last day of the MLA 2017 Annual Meeting and distributed through MLA-FOCUS. It was clear in May 2017 that MLA needed to reconsider what structure would be best to support its members in engaging in communities and plan for a successful future.

Areas of concern that had been identified in previous reports, and repeated frequently through CSGTF's background work, included:

- Unequal access to support community engagement in and financial support for programming
- Difficulty engaging members in leadership opportunities, while at the same time, members felt it difficult to break into service at the national level (communities are national service opportunities)
- Difficulty working across sections to take action at a grassroots level
- Visibility of sections' and SIGs' contributions

The benefits envisioned for community membership included providing opportunities for people to coalesce around topics of mutual interest, share ideas, and improve professional work by engaging in meaningful activities.

Section Council was a multi-tiered system within MLA. If a section had a significant number of members (and, therefore, a significant treasury), the section could provide many benefits to their members (e.g., scholarships, meals, multiple programs at the annual meeting, etc.). Because SIGs had none of these resources, they depended on sections to partner with them for access to programming times at the annual meeting. If a section had a strong leadership tradition, leaders were coached on how to work collaboratively with other sections, how to engage with headquarters, and how to accomplish their goals. Sections with less stable leadership and SIGs, due to their structure, did not have that built-in support. At the MLA

2017 Annual Meeting, CSGTF heard from Section Council and MLA members that the organization needed a system that engaged members and enabled their interdisciplinary work to advance the organization's core areas of interest.

The following association year (2017-2018), CSGTF debated proposed frameworks for a renewed community structure. The task force referred to the guiding principles, feedback received at the MLA 2017 Annual Meeting, recommendations from previous groups, and member input received during the brainstorming and design phase. CSGTF coalesced around a structure originally called Communities of Practice, later called Domain Hubs. Each affinity group/caucus (formerly a section or SIG) would align with at least one community of practice/domain hub. The domain hubs, an idea that grew out of work from previous task forces, aligned the caucuses' work with the MLA professional competencies and the practice areas of Clinical Support, Education, Health Equity & Global Health, Information Management, Information Services, Innovation & Research Practice, and Professionalism & Leadership [4,13]. A domain hub would be a supporting group to facilitate the work across caucuses and would be connected to MLA programs and committees to provide support as well as recommendations for activities and leaders. To signify the new structure, Section Council would become Community Council representing the equal footing of all caucuses. As part of this framework, section dues would be eliminated. Any MLA member would be able to join any number of caucuses without financial barriers. Furthermore, the work of caucuses and hubs would be supported by the MLA budget.

CSGTF solicited feedback from section chairs (current and incoming), SIG conveners (current and incoming), and MLA's Diversity and Inclusion Task Force during the design phase, January - April 2018. Prior to the MLA 2018 Annual Meeting, CSGTF provided MLA membership with the proposed framework. Members of CSGTF offered every section and SIG an opportunity to have a task force member come to their annual meeting (in person or virtually) to discuss the framework, ask questions, and address concerns. Task force members attended 43 meetings of sections/SIGs; held a well-attended open forum at the MLA 2018 Annual Meeting in Atlanta, Georgia; and hosted two additional virtual meetings to provide space for members' input. After incorporating feedback received from various stakeholders, CSGTF presented the proposed framework to the MLA Board of Directors, who approved the framework at a meeting in summer 2018 [16]. A new group was then formed and charged with the implementation of the new framework: the Community Transition Team.

COMMUNITY TRANSITION TEAM

Building on the work and recommendations from previous task forces, the Community Transition Team (CTT) was established in November 2018. An ambitious goal was set to have all sections (22) and SIGS (26) become caucuses by September 1, 2019.

Working groups were established to address key aspects of the new structure:

- Domain Hub Startup Workgroups
- Community Policies Workgroup
- MLA Committees Workgroup
- Finance Workgroup

It was through the work of the volunteers and MLA staff in these working groups that the overall goal of changing the MLA community structure was achieved. Details on the mission, deliverables, and timelines for each of these working groups is available on MLANET [21].

Domain Hub Startup Workgroups

Seven Domain Hub Startup Workgroups, each with four members, did an incredible amount of planning and development to bring structure to this new element of MLA communities. Domain hubs were established to facilitate project coordination across caucuses and create more leadership opportunities for MLA members. Visions and first year milestones were established by every domain hub.

Community Policies Workgroup

The Community Policies Workgroup created new policies to guide the structure and responsibilities of caucuses, replacing section bylaws and manuals. The resulting document, *Medical Library Association Board of Directors Policies Governing Caucuses, Domain Hubs, and Community Council*, was approved on July 22, 2019, by the MLA Board of Directors [22]. Working with the MLA Bylaws Committee, it was determined that sections becoming caucuses was a nomenclature change rather than a functional one. A vote of MLA membership would not be required to change to the structure of MLA sections, sigs, or section council into the proposed causes, domain hubs, and community council.

MLA Committees Workgroup

The Committees Workgroup reviewed existing committees and made recommendations for updates and changes, which were approved at the November 2019 MLA Board of Directors meeting. A significant change was to ensure that there were formalized liaisons to the seven domain hubs to MLA committees. Previously, committee or jury appointments may have liaisons to related areas (e.g., Oral History committee often had a liaison from the History of Health Sciences section) but it

was not required. This change included liaisons to the editors of *MLA Connect* and the *Journal of the Medical Library Association (JMLA)*; members of the National Program Committee; and members of the Education Curriculum Committee. Finally, revisions were made to the Academy of Health Information Professionals (AHIP) point index to include five new roles related to communities. References to the caucuses and communities were included in the MLA Bylaws adopted in 2023.

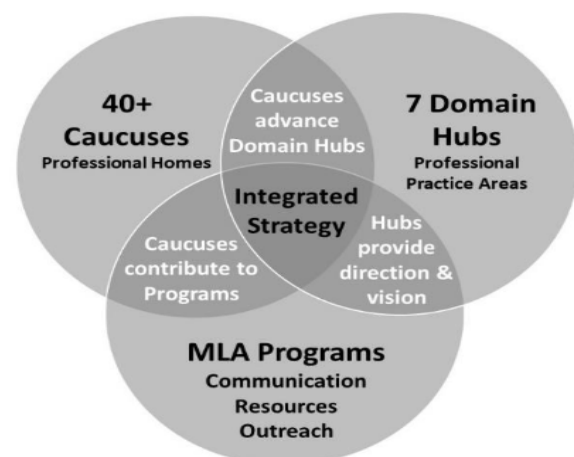
Finance Workgroup

The Finance Workgroup was charged with defining the 2020 budget for community initiatives and the use or reallocation of accumulated section funds. Sections were legally part of MLA and not separate entities, so the MLA Board of Directors had ultimate authority and responsibility for the management of these assets [23]. Section treasurers were included in discussions and made recommendations to the Board of Directors for the use of their existing funds. A process was developed for domain hubs and caucuses to request funding for projects.

In addition to the operational changes and logistics needed to transform sections and SIGs into caucuses, communication with MLA members was understood to be an important element for success. Open forums were held at the MLA 2019 Annual Meeting to provide updates and answer questions; several posts to *MLA Connect* were written by leaders of CTT and other members of the various working groups; and interviews with MLA community leaders were conducted and posted on the MLA website.

Figure 1 was a central communication element used in presentations and on the MLA website to illustrate the connections within the evolving MLA organizational structure. The text in white describes the intended synergies from the new structure.

Figure 1 Collaboration, content, programming, and communication matrix [24].



IMPACT OF THE NEW COMMUNITY STRUCTURE

Reviewing the outcomes of the transition to the caucus and domain hub structure, there have been both successes and failures. Houk et al conducted an early assessment of the change process with recommendations for communication and trauma-informed practices for further changes [24]. Focusing on the goals originally set forth in the charge, the removal of financial barriers to joining a caucus led to an overall growth in the number of individual members joining caucuses and the number of caucuses a member joined. In 2018, the ratio of section members to MLA members was 2:1. By 2023, the ratio of caucus members to MLA members had grown to 4.4:1 (see Table 3). Along with the opportunity to join groups without financial barriers, the structure provided more opportunities for leadership growth by creating domain hub representatives (a member of a caucus who would represent that caucus's interests in discussions of domain projects/efforts) and domain hub chairs. Furthermore, the Community Council manual required that these positions be filled by different members (no member could serve in two or more caucus leadership roles) to create opportunities for member engagement. Unfortunately, with the uncertainty of the first year of the new structure, it was difficult to find members willing to step into these roles.

Table 3 MLA and community membership, 2018-2023

	2018	2019	2020	2021	2022	2023
MLA Members	2,663	2,348	2,341	2,370	2,370	2,389
Caucus Members	5,310	5,838	7,279	8,729	8,634	10,559
Sections	22	21	n/a	n/a	n/a	n/a
SIGs	26	27	n/a	n/a	n/a	n/a
Caucuses	n/a	n/a	43	43	43	42

This brings us to early 2020. During the first full year of implementation of the new structure for communities, the world experienced a public health crisis, the COVID-19 pandemic. The best-laid plans for continuing engagement with association members were quickly falling by the wayside as MLA began to realize that an in-person annual meeting, which was helpful to previous task forces in sustaining momentum, may not happen. While a virtual annual meeting was held in mid-summer 2020, the emotional labor required by all members to sustain the change process rightly was realigned to work supporting health care professionals. Our individual responsibilities of protecting the welfare of our communities, caring for family members, and caring for our own physical and mental health became paramount. The CTT was designed

to complete the transition of MLA's organizational structure in 2020-2021, a season of completely remote activities, significant repeated public health crises, and a growing racial justice movement in the United States. The caucus plus domain hub structural transition of MLA communities did not evolve as originally planned because changes to organizational structure became a lower priority.

Recommendations for assessing these changes to organizational structure originated with CSGTF. These ideas were shared by the CTT with the MLA Board of Directors, and a further Ad Hoc committee was established in 2023 to assess the effectiveness of the changes [18]. With additional input and modification, surveys and interviews of MLA members were conducted. It was determined that, in most cases, the domain hubs did not facilitate structured collaboration as had been hoped and the additional leadership opportunities created proved challenging to maintain. A recommendation to sunset domain hubs was approved by the MLA Board of Directors in August 2023. Domain Hubs remained active until May 31, 2024.

CONCLUSIONS

MLA is the professional home for many health science information professionals and has continued to evolve to better support their professional development and networking needs. In doing so, MLA must also remain a sustainable and relevant association.

Formal competency statements help define professional practice and guide professional development activities. MLA's professional competencies fall within broad themes that endure over time, but specific, measurable performance indicators do change. These performance indicators help an individual determine levels of personal proficiency. The MLA Competencies Self-Assessment tool is an aid for determining what skills a person might want to acquire or improve in proficiency as their job titles and roles change [25]. An individual is not expected to achieve mastery in all competency categories.

MLA's professional competencies have influenced the content of its educational programs, discussed elsewhere in this issue. In addition, MLA's competency statements have provided a framework for medical librarianship courses in graduate programs and helped set expectations for information professionals new to the field. Competency statements require ongoing review and revision; they are not static. The MLA competencies are due for review and revision in the next two years. These competencies have also guided the evolution of MLA communities, and competencies play an active role in MLA member and caucus goal setting.

MLA's organizational structure of communities has been redesigned over the years but continues to be a challenge.

In a member-driven organization, structural changes can only do so much to increase engagement. Members drive the priorities and opportunities for our own future. In the next 25 years, the authors look forward to the continuing efforts to promote member involvement in a thriving MLA.

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IN MEMORY OF GALE G. HANNIGAN

Stephanie, Rikke, and Jodi would like to take a moment to remember Dr. Gale G. Hannigan and acknowledge her work and years of service to MLA and librarianship. Without her wisdom and persistence, the 2017 revision of the MLA Competencies and this article would not have come to fruition. We were moved by her professional excellence and perseverance and feel fortunate to have worked with her on this project. Her beautiful spirit lives on in glimpses of the natural world.

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The evolution of our profession and association from 1998-2023: reflections from four Medical Library Association leaders

Kristine M. Alpi, AHIP, FMLA; Julie M. Esparza, AHIP, FMLA; Brenda F. Green, FMLA; Shannon D. Jones, AHIP, FMLA

See end of article for authors' affiliations.

On the occasion of the Medical Library Association's 125th Anniversary, four librarian leaders with a combined 105 years of engagement in MLA collaborated to reflect on the changes in our profession and our association. We draw on an examination of the last 25 years of the MLA Janet Doe Lectures, our own personal histories, and scholarship we produced for MLA publications and presentations. We offer this compilation as an invitation for readers to reflect on their experiences of changes within the profession, inspiration to engage in the issues around our place in society, and a source for additional exploration into researching and learning from our collective history.

INTRODUCTION

The collaborative work that follows resulted from an invitation to reflect on our personal experiences during the last 25 years of the Medical Library Association (MLA). This period encompasses almost the entirety of our professional connections with MLA, ranging from 22 to 32 years each. We structured it as individual essays, but we each read and commented on each other's experiences, recognizing that we had some shared experiences during overlapping association activities and unique perspectives. Brenda Faye Green begins with an examination of the last 25 years of the MLA Janet Doe Lectures. Then, three past MLA presidents—Julie Esparza, Kristine Alpi, and Shannon Jones—offer essays on changes in our profession and our association through the lens of our personal histories reinforced by references to scholarship we produced for MLA publications and presentations. We aim to share our view of changes within the profession, inspire you to engage in the issues around our profession and association's place in society, and continue learning from our collective history.

Brenda F. Green, FMLA, Associate Professor, Retired, University of Tennessee Health Science Center

JANET DOE LECTURES

My professional development as an academic health sciences librarian has been enriched through attendance at the MLA's annual meeting. These meetings are characterized by a plethora of programming, continuing education opportunities, social engagements, and various supplementary activities. Notably, the scheduling of concurrent sessions during the meeting is customary,

ensuring a diverse array of topics and discussions for attendees.

However, the annual Janet Doe Lecture (Doe Lecture) is one of three lectures that do not have competing programming or activities thus signaling the significance of the lecture [1]. The Doe Lecture envisioned to address historical and/or philosophical topics, began in 1966 [2]. Early in my career I began attending the lectures.

This article aims to retrospectively examine the Doe Lectures from 1998-2023. During this time, lecturers shared interesting hobbies, commented on issues of the day, celebrated thought leaders and risk-takers, and explored historically significant topics. Diverse lecture topics were delivered.

Diverse Topics

Throughout this period, biographical and historical lectures have covered a broad spectrum of topics. Many speakers elected to disclose personal information that was previously undisclosed or limited to their inner circle.

Rick Forsman mentioned "scuba trips" in his 2004 lecture and he gave an apt description of the lecturer's mindset when he wrote the following:

" . . . the talk by its nature derives from the personal values, passions, and unique experience of the lecturer. To a significant degree it is a self disclosure, an intimate exposure of how one thinks, what one believes is important . . ." [3].

Notably, Julie Sollenberger, a practitioner of mindfulness, concluded her lecture with a meditative exercise, underscoring the multifaceted nature of lectures during this time. Her lecture, along with almost all Doe Lectures,

has a citation in PubMed and/or PubMed Central databases. Additionally, her citation includes a supplemental material link to her slides, and a video of her interactive lecture [4].

In 2008, Elaine Martin gave a lecture on issues of importance to her including social justice:

But I must confess my choice of topic comes from contemporary concerns about what is going on in our society today and is influenced by movements such as #BlackLivesMatter, #MeToo, #Enough, #Resistance, #NeverAgain, and #MarchforOurLives, and the proliferation of accepted terms such as “Fake News” or “alternative facts” [5].

In 2023, Michelle Kraft’s historically focused lecture pointed to the actionable strategies and rationales for medical librarians to engage in efforts to combat fake news from the position of its “impact on medical and health information” [6].

In the 2011 Doe Lecture, Scott Plutchak, former editor of *Bulletin of the Medical Library Association*, provided rationale for encouraging journal authors to merely state “librarians” did thus and so rather than stating our “library” completed actions done by librarians [7]. Several lecturers implored members to engage in research. One such lecture, given by Sherrilyn S. Fuller in 1999, provides a brief history of the Research Section’s 1982 beginning with “Gwendolyn Cruzat, chair, Anna Cleveland, chair-elect and Dottie Eakin, secretary” [8].

Thought Leaders and Risk-takers

Numerous speakers commended librarians demonstrating a willingness to take risks. In 2006, Julie McGowen mentioned several risk-takers in her lecture. McGowen provided ample proof to support her contention that the following librarians were bonafide risk-takers: Nancy Lorenzi, AHIP, FMLA; Nina W. Matheson, AHIP, FMLA; Naomi Broering, AHIP, FMLA; Rachael (Anderson) Goldwyn, AHIP, FMLA; Susan Crawford, AHIP, FMLA; Jacqueline Donaldson Doyle, AHIP, MLA; Lois Ann Colainni, AHIP, FMLA; Betsy Humphreys, AHIP; and Anne Kabler Robichaux [9].

Many of the aforementioned librarians, several of whom were featured as Doe lecturers, were recurrently cited across multiple Doe Lectures. McGowan’s meticulously researched presentation offered biographical insights and documented pivotal advancements within our academy of practice. Their contributions to these lectures often held significant historical relevance [9].

Historically Significant Topics

Historical lecture topics included mediated services [10], textual analysis [11], evidence-based librarianship [12], and oral histories [13]. Michael Kronenfeld’s 2022

historical lecture focuses on, “the transition of the health related print Knowledge-Based Information base to the emerging digital health-related ecosystem” [14]. Our academy of practice and MLA’s history are documented in many lectures.

Relevance

Doe Lectures serve as a valuable resource for biographical and historical inquiry. I encourage you to read the lectures in their entirety. Due to space limitations, only small portions of the lectures are discussed. This article highlights the Doe Lecture as a pivotal indicator of evolving trends within the profession, a platform for identifying mentors, and a reflection of MLA’s commitment to addressing contemporary societal issues. Lecturers adeptly forecasted shifts within the profession and proposed actionable solutions. Moreover, they courageously challenged librarians and the association to confront the complexities of our historical narrative.

Julia M. Esparza, AHIP, FMLA, 2019-2020 MLA President

CHANGES IN OUR PROFESSION

Changes in Technology and Resources

Technology significantly changed the interaction between health information professionals and our constituents [15-18]. While reference questions still range from basic to extremely challenging, they now come via email and chat. We have adapted and become experts in new technologies. The transition from paper to electronic resources led to innumerable changes in workflow. Personally, 25 years ago, while working as a serials librarian, I went from checking hundreds of paper journals to purchasing my first of many electronic journals, which reduced my workload and provided faster and more convenient access to library users.

Also, from Toxline to PubChem, we have witnessed the startup and decline or absorption of many health and scientific information resources. Point-of-care resources are now entrenched in our world. While some health professionals see these tools as the answer to everything, others still look to the primary literature as evidence to guide their practice – and for that, they call on us [19-20]. While there have been many times in the last 25 years that we responded rapidly to our users’ needs, never was this more vital than during the COVID pandemic when information was changing rapidly. During this period of upheaval, librarians responded by assisting in research and clinical environments with great dexterity [21-22].

Changes in Our Environments

From 1998 to 2021, there were over 1,887 hospital mergers [23]. Mergers and consolidation into bigger systems

remain a concern when they result in the elimination of health information professional positions [24]. Some downsized professionals left the profession for other opportunities. From 2002 through 2007, I was a hospital librarian. Following the complete elimination of my staff, disenchantment with hospital librarianship prompted me to move to academia. Yet, many hospital librarians thrive. Those who have flourished in hospitals and health systems have created a strong base of support by contributing to quality improvement, publishing, and systematic reviews, rounding with healthcare teams, and fulfilling other needs such as managing patient education or continuing medical education [25-28].

Hospital information professionals are not alone in responding to adversity with reinvention. Some academic health science libraries, which were once showpieces in many medical schools, have lost space—and much, if not all, of their print collections [29-37]. While going through this process, health information professionals often advocated for the best use of the space to create new learning environments. By adapting, we persevered through the changes and came out stronger. At my institution, we were hesitant to eliminate one floor of our collection to create a study area, but careful planning and design led to us having a closer connection to students.

Changes in our Roles

In 2013, new roles for information professionals were identified—embedded librarians, informationists, systematic reviews, emerging technologies, continuing medical education, grants development and data management [38-40]. Data management ties us directly back to the research world [41-42]. Searching for datasets or to create data repositories is now a feature of some health information professionals' jobs. We help researchers organize and label their data and assist them in drafting their data management plans. This new area is helping us ensure researchers are on track to fulfill governmental and institutional regulations. However, clinical and consumer health informationists are still needed. Additionally, medical students still need to learn evidence-based medicine and researchers still need expert searching. Add this to the liaison positions, clinical librarian roles, work in the molecular and biological sciences, roles with nursing and other allied health professions, and we are a vibrant group of professionals.

Our roles have changed in a variety of ways. In the area of collection management, I have seen over the years some job titles transition from “acquisitions” and “cataloger” to “electronic services,” “electronic resource librarian,” or “digital asset manager.” Other technology roles include expanded resource management and managing 3-D printing, augmented reality, and other new technologies.

With the advent of systematic reviews, our specialized skills as health information professionals are in demand.

This creates an important new role for our profession. Advocacy for health information professionals to be involved in creating high quality systematic reviews has grown since 2005 [43-45].

Leadership in the profession has also changed. While leaders still have their normal leadership duties, there is greater emphasis on ensuring equity and inclusion while addressing employee wellness and mental health issues. Library leaders must be politically savvy marketing managers, communicators, and visionaries.

Together we, as MLA, have done an amazing job helping each other deal with 25 years of profound change. Continuing education programming offered at MLA annual conference since 1998 shows a responsiveness that is essential for our profession covering topics from learning about diversity, equity and inclusion, how to complete systematic review searching, handling electronic resources, understanding coding languages, applying metadata, general new technology, and growing as a professional. In their 2023 article, Laynor, Tagge, Magro, De Armond, Rau and Vardell mentioned that MLA mentors, courses, or specializations continue to be important to developing new information health specialists [46].

As our profession changes, we answer the call through continuing education, seeking mentorship, and developing networks to hone our skills. We have faced many challenges, but we are adept at meeting them.

Ms. Esparza greatly appreciates David C. Duggar and Elliott Freeman from Louisiana State University Health Sciences Center at Shreveport for their assistance in this piece.

Kristine M. Alpi, AHIP, FMLA, 2021-2022 MLA President

GROWING WITH MLA'S SUBJECT SPECIALIZATION AND PROFESSIONAL DEVELOPMENT NETWORKS

Developing Expertise in Health Information Practice

During these 25 years, collections and technology have evolved, while subject specialization remains a question. Health science librarians are not defined by physical spaces and print collections, but by the learners and practitioners we connect with information. Consumer health information has evolved from curating local, volunteer-managed print and web resources to federally-funded, national services connected to corporate systems. One thing that has not changed is questioning how much subject expertise and knowledge of resources is needed to succeed within health librarianship.

I leaned into learning from MLA communities of practice. The first MLA continuing education (CE) course I attended introduced the major texts for clinical disciplines. Core lists such as the Brandon/Hill lists [47] and MLA-

published BibKits were the basis of collection development. While no longer published, archived versions remain useful to identify classic texts. I used one version in 2021 to examine resources for respiratory therapists. Additionally, MLA produced print consumer health information Medspeak brochures.

Joining MLA National and Regional Communities

MLA Chapters and Sections introduced me to exciting collaborations related to collections and publications. In 1998, I joined health and public librarians in the New York-New Jersey Chapter, collaborating on the bilingual health website New York Online Access to Health (NOAH) which won MLA's 2006 Thomson Scientific/Frank Bradway Rogers Information Advancement Award. NOAH was retired as Spanish language content became available on MEDLINEplus. In 1999, I took on an additional part-time position with nurse-turned-librarian, Susan Jacobs. She brought me into the Nursing and Allied Health Resources Section project on Mapping the Nursing and Allied Health literature with Peg Allen [48] where I mapped Emergency Nursing [49] and Public Health Nursing literature [50].

MLA Special Interest Groups (SIGs) were a place to meet subject matter experts. I joined the SIG on Molecular Biology & Genomics where librarians such as myself, with high school biology and chemistry, connected with information practitioners with graduate degrees in Genetics, Biotechnology, Immunology or other life sciences. Renata McCarthy (now Geer) brought us into the National Center for Biotechnology Information's Educational Collaborative to develop and teach CE workshops. We shared about stories about providing bioinformatics services in *Journal of the Medical Library Association* (JMLA) in 2006 [51].

Learning through Sharing Knowledge

Teaching CE courses is a great way of learning. I contributed to MLA and the National Library of Medicine's CE courses for Partners in Information Access in Public Health. In 2004, I received a Sewell Foundation stipend to attend the American Public Health Association's annual meeting; this fund supports networking while librarians gain subject matter expertise. I wrote that librarians are powerful contributors to public health in 2007 [52]. Joey Nicholson and I wrote, as a result of our engagement in public health, about pursuing our masters in public health for *MLA News* in 2008 [53].

As I learned more, connections across MLA communities became more apparent: expert searching and grey literature, open access, connecting practitioners to point of care resources, and outreach to unaffiliated practitioners. As Director of the William Rand Kenan, Jr. Library of Veterinary Medicine, I joined the global community of veterinary librarians. The focus on One Health, the

interdependence of humans, animals, and the environment, brought my library, public health, and veterinary knowledge base together. In 2009, Carol Vreeland, DVM, MLS, I developed an MLA CE on the Animal-Human Health Knowledge Connection for the Association of North Carolina Health & Science Librarians. The MLA/Medical Informatics Section Career Development Award enabled me to study the intersection between the medical informatics and veterinary communities [54].

Interprofessional Practice Across Settings

Thinking about where students will practice after graduation and what libraries will support them has always motivated me to partner with other types of libraries. With pharmacists supporting veterinary medical centers who need to learn about animal health and efficiently find veterinary literature, I co-authored an analysis of the veterinary pharmacy literature [55] intended to help pharmacy schools partner with veterinary libraries. With funding from MLA's Ursula Poland Award, I shared findings at the 2018 International Congress for Animal Health Information Specialists.

Changes in libraries have been captured in the names of MLA communities. Public Health/Health Administration dropped Libraries from the name to welcome information professionals regardless of where they worked. The change from Veterinary Medical Libraries to Animal and Veterinary Information Specialists parallels the veterinary medicine accreditation standard language to move from having a physical library to access to human, digital, and physical resources and the information literacy education provided by information professionals.

As a project funded by MLA's then Kronick Traveling Fellowship, I visited five public health libraries in 2005 and all of those had their space repurposed, physical collections were often consolidated into larger health sciences libraries or replaced with digital collections [56]. One of the biggest concerns I have is materials that are only available as leased digital content. The move from owning to leasing core texts is very much a concern in 2024 with discussion posts about the challenges of earlier editions disappearing from packages without notice. It is hard for libraries of public universities serving residents or unaffiliated providers working in the state to ensure access to health knowledge resources.

Staying Connected Throughout Your Career

As MLA President (2022), I followed all 40-plus MLA caucuses and MEDLIB-L and observed the interconnecting themes. Communities blend contributing and lurking, with a small nucleus actively sharing knowledge or setting up learning activities. They are a benefit of MLA membership and knowing the participants makes it easier and safer to share information on thorny issues. You never

truly leave these communities, the knowledge and network keep building on each other like a coral reef expanding on a solid scaffolding in a healthy environment. MLA spawns new knowledge branches as we need them. Today's MLA is greatly extended from medical into the much broader realm of the social determinants of health and often practicing outside of a traditionally defined library.

**Shannon D. Jones, AHIP, FMLA (she/her), 2022-2023
MLA President**

DIVERSITY, EQUITY, INCLUSION, AND BELONGING IN MLA

Reflecting on the past 25 years of MLA's history, my journey as a Black librarian and champion for diversity, equity, inclusion, and belonging (DEIB) comes into focus. The lens through which I view this period reveals transformative progress toward actualizing its guiding principle: "Diversity, equity, and inclusion are the threads that strengthen the fabric of the Medical Library Association" [57].

In 2002 MLA became my professional home. I was eager to share my time, talent, and unique voice for the greater good of health sciences librarianship. I am proud to witness MLA's efforts to build its DEIB capacity and transform itself to a point where new librarians and Black librarians belong.

Real Action in Diversity, Equity, Inclusion and Belonging

When I joined MLA, I noted a need and opportunity to foster racial diversity. The pervasiveness of whiteness was palpable at the annual meeting, in the leadership, and on committees. Even in the early 2000s, MLA said it embraced DEIB; however, real action only happened with the appointment of the Diversity and Inclusion Task Force in 2017. An impactful action by the Task Force was to conduct a member survey in 2019 to gather demographic information and member perception of MLA's DEI efforts [58]. Since 2017, meaningful actions have included codifying DEI as a core value, appointing a standing committee, and improving diversity, inclusion, and accessibility in annual meetings [57].

Diversity, equity, and inclusion are critical in promoting a sense of belonging. As members experience a sense of belonging, they see themselves represented and treated fairly; experience acceptance; and gain meaningful connections throughout MLA. In essence, belongingness shapes a member's experience within the association. With this sense of belonging, members will likely maintain their memberships and service to MLA. I posit incorporating belonging into MLA's DEI efforts is necessary to build a more just and equitable experience for everyone.

African American Medical Librarians Alliance (AAMLA) Caucus

MLA's AAMLA Caucus is my primary professional family. I came into the Association fully aware that Black librarians were underrepresented in the profession and MLA. I wanted to do something about it. AAMLA is where I found my voice, my tribe, and my professional success, thanks, in part, to librarians who came before me. Librarians such as Sandra Franklin, Rosalind Lett, Sandra Martin, Beverly Murphy, Elaine Wells, and other AAMLA members have been outstanding mentors, sponsors, and champions to me in MLA. They encouraged me to run for leadership positions and supported me when I did. AAMLA is where I met lifelong friends and colleagues who share my passion for promoting DEIB and creating environments where Black librarians thrive.

Belongingness for New Librarians and Members

One of my most meaningful contributions to MLA was in 2005, when I created the New Members Special Interest Group (now Caucus). At the heart of forming the group was cultivating a sense of belonging for new librarians and members. With the encouragement and support of members of AAMLA and the Mid-Atlantic Chapter of MLA, I sought to establish a space for new librarians and members to call their own, where they could feel welcomed, heard, included, and supported. The goal was to provide a forum for members with less than three years of experience to discuss information related to their experience as new librarians and members and to foster a sense of belonging and community. Much of my early leadership experience came from serving as the inaugural convener of this group, which remains a vibrant and vital community to this day.

Say Their Names

Celebrating MLA's 125th anniversary supports my aim to document the contributions of Black librarians whose contributions have not been acknowledged or celebrated as part of our history. It is imperative that MLA's history includes names and stories of early Black pioneers. Pioneers such as Josephine G. Morton, 62 years before I attended my first MLA meeting, became the first Black librarian to attend an MLA conference in 1940 [59]. Thirty-nine years later, in 1979, Arlee May became the first Black librarian elected to the MLA Board of Directors [60]. That same year, Dr. Gwendolyn S. Cruzat delivered the prestigious Janet Doe Lecture [61], becoming the first Black librarian to do so. I was unaware of these Black trailblazers when I joined MLA. I now recognize my successes in MLA builds upon their pioneering work. I am excited to have witnessed Beverly Murphy become the first Black librarian elected MLA President in 2016. This was a significant milestone in the Association's history [62].

MLA has come a long way with its DEIB efforts, but much work remains. I am confident that we will continue prioritizing belonging to ensure all members feel welcomed, valued, seen, heard, affirmed, and included. We must center the voices and experiences of those historically excluded within MLA. More importantly, in today's climate, we must continue our advocacy for DEIB, not just within MLA but also in our workplaces and communities. I am proud to call MLA my professional home. I look forward to continued collaborations with MLA colleagues to advance DEIB and to build a more just and equitable MLA for all.

CONCLUSION

As we celebrate the 125th anniversary of MLA, we are grateful for the progress made over the last 25 years and optimistic about our future. We hope this reflection inspires MLA members to contemplate their experiences and contributions to the Association and how those experiences shape our collective future. This writing is also a call to action for MLA members to engage with the issues surrounding the role of health sciences librarians in society and to continue advocating at the national, regional, and local levels. Overall, this compilation is a testament to the resilience and adaptability of the Association and its members as we strive towards a brighter future.

AUTHOR CONTRIBUTIONS

Kristine M. Alpi: Conceptualization, Writing – original draft, Writing – review & editing; Julia M. Esparza: Conceptualization, Writing – original draft, Writing – review & editing; Brenda F. Green: Conceptualization, Writing – original draft, Writing – review & editing; Shannon D. Jones: Conceptualization, Writing – original draft, Writing – review & editing.

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Finding full texts in bulk: a comparison of EndNote 20 versus Zotero 6 using the University of York's subscriptions

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Objective: To understand the performance of EndNote 20 and Zotero 6's full text retrieval features.

Methods: Using the University of York's subscriptions, we tested and compared EndNote and Zotero's full text retrieval. 1,000 records from four evidence synthesis projects were tested for the number of: full texts retrieved; available full texts retrieved; unique full texts (found by one program only); and differences in versions of full texts for the same record. We also tested the time taken and accuracy of retrieved full texts. One dataset was tested multiple times to confirm if the number of full texts retrieved was consistent. We also investigated the available full texts missed by EndNote or Zotero by: reference type; whether full texts were available open access or via subscription; and the content provider.

Results: EndNote retrieved 47% of available full texts versus 52% by Zotero. Zotero was faster by 2 minutes 15 seconds. Each program found unique full texts. There were differences in full text versions retrieved between programs. For both programs, 99% of the retrieved full texts were accurate. Zotero was less consistent in the number of full texts it retrieved.

Conclusion: EndNote and Zotero do not find all available full texts. Users should not assume full texts are correct; are the version of record; or that records without full texts cannot be retrieved manually. Repeating the full text retrieval process multiple times could yield additional full texts. Users with access to EndNote and Zotero could use both for full text retrieval.

Keywords: Full text retrieval; find full texts; find available PDF; endnote; zotero



See end of article for supplemental content.

INTRODUCTION

In evidence synthesis projects, after the initial stage of screening on titles and abstracts, researchers require access to the full texts. Citation management software such as EndNote and Zotero both have options to find full texts in bulk and automatically attach these to the relevant records. However, EndNote and Zotero do not retrieve all full texts, even when these are available open access or through an institution's subscriptions [1]. This results in having to manually search for and download remaining full texts, which can be time-consuming.

Both EndNote and Zotero are widely used by information specialists and researchers for managing records from database searches or other sources. EndNote desktop requires the purchase of a license (which includes software updates but not later releases of the software unless the license is upgraded) [2]. In comparison, Zotero can be used for free with no limits on storage space but no

cloud storage. For users who require their data to be synced with Zotero's cloud storage (to work collaboratively, or across multiple devices), the program can be used for free with a limit of up to 300 MB data; it also has subscription tiers which determine the storage space per user or institution [3].

Researchers can use either EndNote or Zotero for screening full texts, although many prefer dedicated systematic review software such as EPPI-Reviewer, Covidence, or Rayyan (though not all systematic review software can interface with EndNote or Zotero). Several institutions have compared the programs' features alongside other reference management software [4, 5, 6]. However, we are unaware of any evaluations that compare the performance of full text retrieval. This information could help information specialists, researchers, and institutions to make an informed decision about using either program (or both), and whether to purchase or subscribe to them.

This paper aims to inform users about finding full texts using EndNote or Zotero. Its objectives are to understand how each program looks for full texts; test and compare the full text retrieval and accuracy of each program; report on unique full texts (found by one program only); investigate whether document versions vary (where both programs found a full text for the same record); report on the consistency of the number of full texts found using the same dataset multiple times; and explore the common features of full texts missed by EndNote or Zotero.

METHODS

This study is based on programs available to the authors: EndNote 20 (version 20.4.1) and Zotero 6 (version 6.0.27) [7, 8]. It was conducted due to the Centre for Reviews and Dissemination's (CRD, University of York) need to understand the performance of EndNote versus Zotero. CRD researchers use a variety of programs for screening, including EPPI-Reviewer. As Zotero is now able to interface with this program to bulk import full texts and attach these to the record [9], we wanted to test its performance against EndNote, which we typically use for full text retrieval.

An overview of the methodology is as follows:

1. Communication with EndNote's technical support team and the Zotero Forum to ask questions on their find full text features.
2. Tests of EndNote and Zotero to determine:
 - the number of full texts retrieved;
 - number of available full texts retrieved;
 - unique full texts retrieved (found by one program only);
 - differences in versions of full texts retrieved (where both programs found full texts for the same record);
 - time taken to retrieve the full texts;
 - consistency of the number of full texts found using the same dataset multiple times; and
 - accuracy (whether full texts were accurate and the version of record; or accurate but not the version of record; or inaccurate).
3. Investigation of the available full texts that were missed by EndNote or Zotero in terms of:
 - the reference type;
 - whether texts were available open access or via university subscription; and
 - the content provider or publisher (e.g., Wiley, Science Direct, etc).

Throughout this paper, the term 'full text' is used to refer to any item that is available online as an electronic

document such as a portable document format (PDF). For this reason, items such as conference abstracts that are available as a PDF are considered full texts for the purposes of this study. The term 'version of record' is used to refer to the publisher's final version [10]. Full texts that are not the version of record could contain differences in layout, copyediting, typesetting, and proofreading.

Understanding the Find Full Text Features

Throughout August and September 2023, e-mail enquiries were made with Clarivate's technical support team and with Zotero's support forum. The enquiries asked which metadata (or lack of metadata) aids or hinders successful retrieval of full texts. Additional contact was made with Clarivate in October 2023 to query whether EndNote 21 (released 19 September 2023) had enhanced performance in finding full texts compared with EndNote 20 [11]. EndNote's webpages on optimizing results using the find full text feature and its frequently-asked-questions page on full texts and PDFs were also used as sources of information [12, 13].

EndNote can search for a maximum of 250 full texts in one go and attach these to the record in the EndNote library. Items searched for are categorized as either: 'Found PDF', 'Found URL' (Uniform Resource Locator), or 'Not Found'.

By default, EndNote can retrieve full text attachments from the Web of Science platform's full text links as well as from PubMed LinkOut [14]. Only the free journal set on the Web of Science platform is checked for all users, whereas users with a subscription may have full IP-based access to all its resources [15]. The digital object identifier (DOI) can help EndNote to retrieve full texts though full texts can still be found without a DOI [16].

If a user has access to an institution's subscriptions, the Open URL and Authentication URL allow some subscription content to be retrieved as a full text and attached to the record. This is set up in the 'Edit' menu on EndNote by going to 'Preferences' and then 'Find Full Text'. Institutions using Ex Libris Alma-Primo can enter the details of their link resolver on the same page [17].

The find full text feature is incompatible with content providers that do not allow third-party software to access and retrieve data from them. This applies to open access and subscription content. EndNote's page on optimizing the find full text results lists its incompatibility with: EBSCO; JSTOR; OpenAthens; Wiley; and ScienceDirect [18].

EndNote marks some items as 'Found URL' if it cannot find a full text but can find the URL, helping users to access the item or obtain a full text manually (if applicable) [19]. At the time of writing, since the release of version 20.4.1 there have been minor changes to the find full text functionality for EndNote version 20.6, including enhanced full text functions for certain journals and

content providers [20]. This information on EndNote's find full text features applies to both EndNote 20 and EndNote 21. Clarivate did not comment on whether EndNote 21 (released 19 September 2023) would have enhanced ability to find full texts over EndNote 20 but described it as having had minimal changes to its full text retrieval features [21].

Zotero, which is open-source software, can look for an unlimited number of full texts in bulk. It can be used for free with no limits on storage space but no cloud storage. For users who require their data to be synced with Zotero's cloud storage (for working collaboratively, or across multiple devices), the program can be used for free with a limit of up to 300 MB data; it also has subscription tiers which determine the storage space per user or institution [22]. Synced libraries can be accessed from the Zotero website without having the software installed [23].

When looking for full texts, Zotero's process is to categorize these as 'Full Text,' 'Accepted Version,' 'Submitted Version,' 'No PDF Found' or 'Failed'. Once found, full texts are attached to the record in Zotero. Zotero also allows subscription content to be retrieved as a full text. Authentication for an institution's subscriptions is set up in the 'Edit' menu on Zotero by going to 'Preferences' and then the 'Advanced' tab. Under 'Open URL,' numerous institutions can be selected in the drop-down menu. Alternatively, users can select 'Custom' and then paste the OpenURL resolver for their institution.

Zotero uses the DOI or International Standard Book Number to find full texts but can also find full texts without this metadata [24]. The program also uses the metadata for articles on CrossRef, which is used by organizations to register their research and ensure metadata is detailed and accurate [25]. At the time of writing, since the release of version 6.0.27 there have been no changes to the find full text functionality on Zotero affecting the current version 6.0.30 (see: <https://www.zotero.org/support/changelog>) [26].

Testing the Performance of EndNote versus Zotero

Four datasets of 250 records (1,000 in total), were taken from three evidence synthesis projects conducted by CRD at the University of York (UoY) and one systematic review by the Cochrane Common Mental Disorders group [27, 28, 29, 30].

Two-hundred and fifty records were randomly selected from each dataset using EndNote (due to its use for reference management in the evidence synthesis projects). Only 250 records were used per dataset as this is the maximum number of full texts that EndNote can search for in one go.

Four different healthcare topics were chosen to allow for differences in the full text retrieval due to variations in UoY's subscriptions. There was also variation by reference

type: for dataset 1, all records were arranged by reference type in EndNote, and 250 were selected from items marked as 'journal articles' in the original library, as this reference type is commonly required by researchers. Datasets 2, 3 and 4 contained mixed reference types to test performance using representative results from evidence synthesis projects. All datasets (sets 1-4) are described below. Although the reference types listed by EndNote will not always be accurate, this was a useful method to provide variety without individually checking each record.

Once each set of 250 records had been selected, they were exported as a .ris file before the find full text process was run separately on EndNote 20 (version 20.4.1) and Zotero 6 (version 6.0.27), using a free account. Each program contained the library authentication details of UoY and were tested individually on the same day and under the same conditions, connected to the University's Virtual Private Network (VPN).

After full texts had been retrieved using both programs, all articles were put into EndNote libraries for each dataset and labeled as either 'found' or 'not found' and with either 'EndNote' or 'Zotero' using the 'custom 4' field (one of numerous fields on EndNote which can be used for custom annotation of records). Where full texts were found, we investigated whether the attached full text was accurate or inaccurate, and if there were differences in the versions found by each program. A full text attachment was considered accurate if it matched the details in the record, though exceptions were made for minor differences in the publication year, volume, issue, and pagination to allow for variations in the metadata for online, ahead-of-print and printed articles, as well as for metadata errors and updates to publications since retrieval from the databases (dates of the searches are listed below). We created additional categorization for full texts that were accurate but not the version of record, with these items checked by both authors. Items were considered 'inaccurate' if the full text was wrong or could not be opened. Accuracy data was labeled in the 'custom 2' field. The number of available full texts was determined by adding together the number of full texts available either via EndNote, Zotero, open access or via UoY's access.

To check if a consistent number of full texts was found using the same dataset multiple times, EndNote and Zotero were tested individually on the same day and under the same conditions, whilst connected to the University's VPN. This was only performed for dataset 4, which was checked four times. The records were re-imported each time.

For the various tests of the performance of EndNote versus Zotero, the mean of all four datasets was calculated by adding together all the numbers retrieved from all four datasets and then divided by four. Where necessary, all

percentages (or numbers listed as the mean) were rounded up or down to whole numbers.

Details of the datasets are as follows:

- Project Title:** Bereavement support and prolonged grief disorder: scoping and mapping the evidence.
Databases Searched: 28 October 2022.
Reference Types: 250 Journal Articles.
- Project Title:** Do routine surveillance investigations improve survival after paediatric leukaemia? A systematic review.
Databases Searched: 5-7 December 2022.
Reference Types: 221 Journal Articles, 1 Book, 8 Reports, 20 Web Pages.
- Project Title:** Communicating cardiovascular risk: Systematic review of qualitative evidence.
Databases Searched: 8 November 2022.
Reference Types: 239 Journal Articles, 1 Thesis, 8 Books, 2 Book Sections.
- Project Title:** Digital mental health interventions for treating depression in adults in low- and middle-income countries.
Databases Searched: 27-29 March 2023.
Reference Types: 186 Journal Articles, 48 Theses, 16 Web Pages.

The process of testing the performance of EndNote versus Zotero is summarized in Figure 1.

Full Texts Missed by EndNote or Zotero

Any full texts that were missed by EndNote or Zotero were investigated and categorized using annotations in the 'custom 2' field in the EndNote libraries used for each dataset.

The following categorizations for articles that were not found by EndNote or Zotero were used:

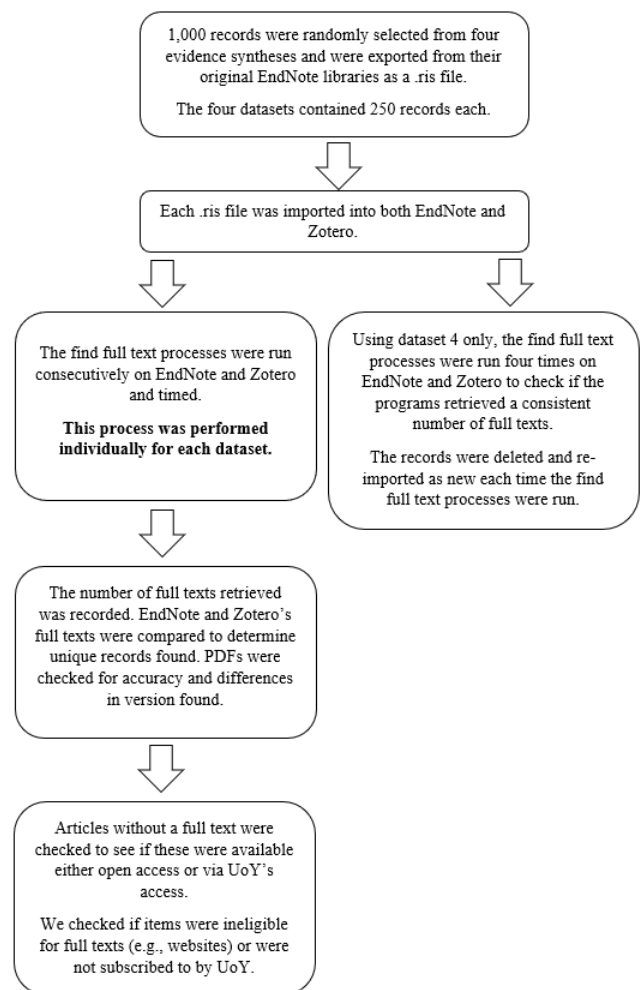
- not applicable (i.e., any record that is ineligible for a full text attachment such as websites; trial registry records; etc);
- no access (for articles that UoY does not subscribe to);
- insufficient metadata (where there was insufficient metadata in the record to retrieve the article);
- available open access; and
- available via UoY subscription.

The 'custom 2' field in EndNote was used to add annotations on the provider of open access and

subscription content. In the process of determining open access from subscription access, all items marked as UoY subscription were double-checked using incognito mode on Google Chrome to prevent single-sign-on authentication.

Although not all the categories above are reported on in this paper, full data is included in the supplementary material.

Figure 1 Testing the Performance of EndNote versus Zotero



RESULTS

Testing the Performance of EndNote versus Zotero:

For each dataset and for each program, Table 1 shows the number of full texts retrieved with either EndNote or Zotero; the number of available full texts (i.e., through EndNote, Zotero, open access or via UoY's access); the

percentage of available full texts retrieved; the number of unique full texts retrieved (i.e., found by one program only); the number of different versions of full texts found (where found by both programs); time taken to retrieve the full texts; and means for all columns.

The mean number of full texts retrieved was 86 (34%) for EndNote versus 95 (38%) for Zotero, as numerous records from each dataset were not applicable (i.e., clinical trial records, websites, etc) or not accessible via UoY's subscriptions. However, EndNote retrieved 47% of available full texts versus 52% for Zotero.

Both EndNote and Zotero found unique full texts. The mean number of unique full texts identified by EndNote was 11 versus 16 for Zotero. Figures were relatively consistent between datasets, except for dataset 2 which had nine unique full texts found by EndNote versus 36 by Zotero.

Three out of four datasets contained different full text versions found by EndNote and Zotero for the same record. For datasets 2 and 3, only two records had different full text versions, compared with 12 different versions in dataset 1. The mean number of differences in the full text version per dataset was four.

The time taken to retrieve the full texts on both EndNote and Zotero was not vastly different between datasets. It took EndNote a mean of 17 minutes and 51 seconds per dataset, versus a mean of 15 minutes and 36 seconds for Zotero. The biggest difference in time taken for a single dataset was for dataset 3, which took EndNote 21 minutes and 8 seconds, compared to 16 minutes and 22 seconds by Zotero [31].

For each dataset and for each program, Table 2 shows the total number of accurate full texts retrieved, which are then broken down into the number of accurate full texts which were or were not the version of record. The table also shows the total number of inaccurate full texts, and the reason full texts were considered inaccurate. Columns which report on the number of full texts that were or were not the version of record show percentages out of the total number of accurate full texts.

Although EndNote found fewer accurate full texts compared to Zotero (a mean of 85 versus 94, respectively), for both programs, 99% of the retrieved full texts were accurate. The mean number of accurate full texts that were not the version of record was eight (9%) for EndNote, compared to seven (7%) for Zotero.

Table 3 reports on the number of full texts retrieved by EndNote and Zotero (out of 250 records taken from dataset 4 only) when the dataset was newly-imported into each program. The date the find full text processes were run is included in Table 3.

The number of full texts retrieved varied for both programs. Whereas EndNote tended to retrieve a similar number of full texts each time, Zotero was much more variable in the number of full texts retrieved.

Available Full Texts that were Missed

For all datasets, Table 4 shows information about the available full texts that were missed by EndNote or Zotero in terms of the reference type and whether texts were available open access or via UoY's subscriptions.

For EndNote, 51% of missed full texts were open access and 49% via UoY's subscriptions. Although Zotero's retrieval of full texts was higher, 47% of missed full texts were open access versus 53% available via UoY's subscriptions.

A variety of reference types were missed by EndNote and Zotero. For both programs, the most common missed reference type was journal articles (although this reference type was the most common for each dataset - see the methods section for full details of the reference types included). Other missed reference types were identical in terms of numbers missed by EndNote and Zotero.

Table 5 shows information about the available full texts that were missed by EndNote or Zotero across datasets 1-4 by the 10 most frequent content providers (i.e., publishers, publisher subsidiaries, or platforms hosting published content). The total number of available full texts that were missed by each program is also listed. See the supplementary material for further information on the content providers of available full texts that were missed.

There is overlap in the most common providers of missed content. For both EndNote and Zotero, the top six providers were Science Direct, Wiley, Sage, Taylor & Francis, Wolters Kluwer, and ProQuest.

Table 1 Retrieval and Time Taken to Retrieve Full Texts

Dataset	Program	FT Retrieval (% of 250)	Available FTs (% of 250)	Available FTs Retrieved	Unique FTs	Difference in FT version (of 250)	Time Taken (minutes, seconds)
1	EndNote	91 (36%)	186 (74%)	49%	13	12	16:37
	Zotero	99 (40%)		53%	5		14:40
2	EndNote	57 (23%)	163 (65%)	35%	9	2	18:29
	Zotero	84 (34%)		52%	36		16:45
3	EndNote	103 (41%)	191 (76%)	54%	13	2	21:08
	Zotero	104 (42%)		54%	14		16:22
4	EndNote	92 (37%)	187 (75%)	49%	10	0	15:11
	Zotero	92 (37%)		49%	10		14:38
Mean	EndNote	86 (34%)	182 (73%)	47%	11	4	17:51
	Zotero	95 (38%)		52%	16		15:36

FT = Full Text

Table 2 Accuracy of EndNote and Zotero

Dataset	Program	Accuracy			Inaccuracy	
		Total Accurate	Accurate: version of record	Accurate: not version of record	Total Inaccurate	Inaccurate Reason
1	EndNote (n = 91)	90 (99%)	81 (90%)	9 (10%)	1 (1%)	1 wrong article
	Zotero (n = 99)	98 (99%)	92 (94%)	6 (6%)	1 (1%)	1 wrong article
2	EndNote (n = 57)	57 (100%)	56 (98%)	1 (2%)	0 (0%)	
	Zotero (n = 84)	84 (100%)	84 (100%)	0 (0%)	0 (0%)	
3	EndNote (n = 103)	102 (99%)	83 (81%)	19 (19%)	1 (1%)	1 wrong article
	Zotero (n = 104)	103 (99%)	83 (81%)	20 (19%)	1 (1%)	1 wrong article
4	EndNote (n = 92)	90 (98%)	89 (97%)	1 (1%)	2 (2%)	1 wrong article 1 corrupt file
	Zotero (n = 92)	90 (98%)	87 (97%)	3 (3%)	2 (2%)	1 wrong article 1 corrupt file
Mean	EndNote	85 (99%)	77 (91%)	8 (9%)	1 (1%)	
	Zotero	94 (99%)	87 (93%)	7 (7%)	1 (1%)	

Table 3 Consistency of EndNote and Zotero

Date Run		29/08/2023	21/09/2023			
Dataset	Program	Original FT Retrieval	FT Retrieval: 1	FT Retrieval: 2	FT Retrieval: 3	FT Retrieval: 4
4	EndNote	92	90	91	90	91
	Zotero	92	133	92	91	91

FT = Full Text

Table 4 Available Full Texts that were Missed

Dataset	Program	Available FTs Missed	Available Reference Types Missed	Open Access Missed	UoY Subscription Missed
1	EndNote	95 (51%)	95 Journal Articles	22 (23%)	73 (77%)
	Zotero	87 (47%)	87 Journal Articles	19 (22%)	68 (78%)
2	EndNote	106 (65%)	104 Journal Articles 2 Reports	84 (79%)	22 (21%)
	Zotero	79 (48%)	77 Journal Articles 2 Reports	60 (76%)	19 (24%)
3	EndNote	88 (46%)	86 Journal Articles 1 Book 1 Thesis	33 (38%)	55 (63%)
	Zotero	87 (46%)	85 Journal Articles 1 Book 1 Thesis	27 (31%)	60 (69%)
4	EndNote	95 (51%)	54 Journal Articles 41 Thesis	56 (59%)	39 (41%)
	Zotero	95 (51%)	54 Journal Articles 41 Thesis	57 (60%)	38 (40%)
Mean	EndNote	96 (53%)	85 Journal Articles 0 Books 1 Report 11 Thesis	49 (51%)	47 (49%)
	Zotero	87 (48%)	76 Journal Articles 0 Books 1 Report 11 Thesis	41 (47%)	46 (53%)

FT = Full Text

Table 5 Top 10 Content Providers of Available Full Texts that were Missed

EndNote		Zotero	
Provider	Available FTs Missed (N=384)	Provider	Available FTs Missed (N=348)
Science Direct	147	Science Direct	131
Wiley	58	Wiley	39
Sage	38	Sage	33
Taylor & Francis	28	Taylor & Francis	26
Wolters Kluwer	14	Wolters Kluwer	10
ProQuest	10	ProQuest	10
Haematologica	6	Oxford Academic	7
Uppsala Universitet	3	Springer	7
EThOS	3	EThOS	3
MAG Online Library	3	MAG Online Library	3

FT = Full Text

DISCUSSION

Understanding and Using EndNote and Zotero's Find Full Text Features

There are several differences between EndNote and Zotero's find full text features worth commenting on. Firstly, EndNote can only look for a maximum of 250 full texts in one go. This means larger datasets may have additional time-savings when run on Zotero since this program was faster and is not limited in the number of full texts it can search for in one go. Secondly, for items not found as full texts, EndNote can find the URL and update the record, helping users find full texts manually. In comparison, Zotero can access additional metadata via CrossRef but does not attach this to the record or correct any differences in the metadata. Thirdly, Zotero's process of categorizing items sought as full text as either 'Full Text,' 'Accepted Version,' 'Submitted Version,' 'Not Found,' or 'Failed' is more transparent in alerting users to the full text versions retrieved.

Once full texts have been found, these can be read (and annotated) inside either EndNote or Zotero or accessed outside the programs using a PDF reader. PDFs or other document formats can be individually attached to the record in either program. Both programs allow multiple attachments per record, which is helpful for users who may want to screen supplementary material alongside the full text paper.

For researchers screening using dedicated systematic review software, Zotero is unique in being able to interface with EPPI-Reviewer to bulk import full texts and automatically attach these to the record in EPPI-Reviewer [32]. As use with EPPI-Reviewer requires syncing data to

cloud storage, the available storage space will vary with the type of subscription to Zotero. In comparison, Covidence and Rayyan cannot interface with either EndNote or Zotero. However, Covidence and Rayyan allow bulk-import of PDFs which then automatically attach to a record [33, 34, 35]. For use with Covidence, Rayyan, or other software allowing bulk-imports, PDFs could have been found and copied from EndNote and/or Zotero or found manually.

Testing the Performance of EndNote Versus Zotero

It is important for users to check whether full texts are the version of record. Notably, all datasets contained full texts that were not the version of record. This was the case for 19% of the full texts retrieved by EndNote and Zotero for dataset 3.

Investigating the unique full texts retrieved by EndNote or Zotero led to the finding that some content providers restrict access to open access content. As an example, a PDF hosted by publisher Mary Ann Liebert [36] denied UoY access even though it was available open access on PubMed Central [37]. Only Zotero was able to retrieve this full text. Double-checking items to ensure they are not available elsewhere could save money for orders placed for full texts (e.g., from copyright libraries such as the British Library, through the purchase of online articles from publisher websites, etc).

EndNote and Zotero tended to make the same mistakes for the few full texts that were inaccurate, though there were minor differences in their inaccuracies. For datasets 1 and 3, the two incorrect full texts were for the same record and had the same incorrect attachment. Similarly, the one

corrupt file found for dataset 4 was for the same record. For dataset 3, EndNote and Zotero each found one incorrect full text but for different records.

Additional testing of retrieval comparing EndNote 20 (20.4.1) with EndNote 21 (version 21.2) for all datasets is not reported on in this paper but is available in the supplementary material.

Full Texts Missed by EndNote or Zotero

Full texts could have been missed for multiple reasons. As noted previously, some content providers prevent third-party software retrieving full texts. Another cause could be suboptimal metadata (either in the original database export or when records were first imported into EndNote). Although this study does not report on the database of origin for the records tested, in some cases the metadata exported from the databases could play a role in whether a full text is found. As an example, the database Social Care Online (SCIE) uses the article's record on the database as the URL rather than linking the user to the article on the publisher's website; it also does not always include the DOI. This could lead to EndNote or Zotero missing full texts. Users could check the metadata in their database exports to ensure DOIs and URLs are being imported. On numerous occasions, we found that a full text PDF was not retrieved by EndNote or Zotero even though the URL linked directly to it. It is unclear to what extent the inclusion or absence of DOIs or URLs affects full text retrieval, as Zotero has access to additional metadata via the use of CrossRef. The authors were unable to investigate this as they are not software developers.

The supplementary material was cross-referenced to analyze data by reference types. This revealed that 'journal articles' were the only reference type found as full texts by either EndNote or Zotero, though the datasets only included small numbers of other reference types. However, as the second most common reference type, none of the 48 theses were retrieved by EndNote or Zotero, even though 41 were available. This finding may not be generalizable but could be useful information for those searching thesis repositories.

There was overlap in the most common providers of missed content between EndNote and Zotero. Clarivate lists some of these content providers as being incompatible with EndNote [38], and Zotero is also likely to be incompatible with certain providers for the same reasons. Table 5 may highlight where one program is more likely to retrieve full texts from some of these providers over the other. However, this is not necessarily the case if, for example, alternative copies of these full texts were retrieved from a different provider. For instance, the earlier example of the Mary Ann Liebert article available open access on PubMed Central [39] found only by Zotero, may suggest Zotero can access PubMed Central. But as Zotero uses additional metadata

from CrossRef, we cannot be certain from which provider a full text was retrieved without further investigation. This means there are too many variables to take Table 5 at face value, even with cross-referencing of the additional information in the supplementary material.

This is an exploratory study based on software and data that was readily available to the authors. Only 1,000 records taken from healthcare literature were tested using UoY's subscriptions in August and September 2023. EndNote 20 (version 20.4.1) and Zotero 6 (version 6.0.27) were used and there have been further enhancements to EndNote's find full text functions for certain journals and content providers since the tests performed in this paper [40].

As all 1,000 records were randomly selected using EndNote (due to its use for reference management in the evidence syntheses projects) all records were subject to EndNote's import filters for each database. It is possible that there could be subtle variations in metadata if database exports were imported directly into both EndNote and Zotero. Moreover, records from some of the databases used in the evidence syntheses were imported using adapted or custom import filters for EndNote.

Reference types of articles used in the datasets were determined by how these were automatically categorized in the original EndNote libraries of the evidence syntheses and were not checked.

Only one content provider was annotated for each missed full text available open access or via UoY's subscriptions, even though some were available from multiple providers.

The time taken for EndNote and Zotero to find full texts may have been affected by computer performance and internet connection.

EndNote and Zotero do not find all available full texts. Users should not assume full text attachments are correct, are the publisher's final version, or that records without attachments cannot be retrieved manually. It is possible that repeating the full text retrieval process multiple times could yield additional full texts. Since both programs found unique full texts, where EndNote has been used for full text retrieval, it may be useful to look for any remaining items without a full text using Zotero (or vice versa), if users have access to both programs.

The performance of EndNote and Zotero was similar in many respects with one exception: Zotero was much more variable in the number of full texts retrieved when testing the same dataset for full text retrieval multiple times. However, for every dataset, Zotero found equal to or more than the number of full texts found by EndNote.

Zotero was superior in terms of the number of full texts retrieved (finding 52% of those available versus 47% by EndNote) and in finding the version of record (at 93%

versus 91% by EndNote). Zotero was also more transparent in terms of which version of a full text was found and was faster than EndNote by a mean of 2 minutes and 15 seconds. For both programs, 99% of the retrieved full texts were accurate.

Overall, the findings are informative for information specialists, researchers, and institutions who may want to decide whether to use one program over the other or both together.

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DATA AVAILABILITY STATEMENT

Data associated with this article are available in the supplementary material.

AUTHOR CONTRIBUTIONS

HF conceptualized the project; corresponded with Clarivate and Zotero; tested and reported on the performance and accuracy of each program; methodology; analysis, writing - original draft, editing & revision.

CE conceptualized the project; reported on the accuracy of the full texts retrieved; methodology; analysis; writing - editing & revision.

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SUPPLEMENTAL FILES

- **Appendix A:** Supplemental Materials

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The NICE search filters for treating and managing COVID-19: validation in MEDLINE and Embase (Ovid)

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See end of article for authors' affiliations.

Objective: In this paper we report how the United Kingdom's National Institute for Health and Care Excellence (NICE) search filters for treating and managing COVID-19 were validated for use in MEDLINE (Ovid) and Embase (Ovid). The objective was to achieve at least 98.9% for recall and 64% for precision.

Methods: We did two tests of recall to finalize the draft search filters. We updated the data from an earlier peer-reviewed publication for the first recall test. For the second test, we collated a set of systematic reviews from Epistemonikos COVID-19 L.O.V.E and extracted their primary studies. We calculated precision by screening all the results retrieved by the draft search filters from a targeted sample covering 2020-23. We developed a gold-standard set to validate the search filter by using all articles available from the "Treatment and Management" subject filter in the Cochrane COVID-19 Study Register.

Results: In the first recall test, both filters had 99.5% recall. In the second test, recall was 99.7% and 99.8% in MEDLINE and Embase respectively. Precision was 91.1% in a deduplicated sample of records. In validation, we found the MEDLINE filter had recall of 99.86% of the 14,625 records in the gold-standard set. The Embase filter had 99.88% recall of 19,371 records.

Conclusion: We have validated search filters to identify records on treating and managing COVID-19. The filters may require subsequent updates, if new SARS-CoV-2 variants of concern or interest are discussed in future literature.

Keywords: Search filters; COVID-19; MEDLINE; Embase; Systematic literature review



See end of article for supplemental content.

BACKGROUND

Reliable and effective literature searches are required for research topics about COVID-19 and SARS-CoV-2. This paper presents validated search filters that can be applied in literature search strategies to identify evidence on treating and managing COVID-19. There is an ongoing need to undertake literature searches on COVID-19, even now that the public health emergency has ended. COVID-19 remains a global health threat leading to death, hospitalization and significant consumption of healthcare resources [1]. It is important to have effective search filters to help us deal with the high volume of research that has characterized the pandemic [2].

Search filters are sets of validated search terms that retrieve records with a common feature from bibliographic databases [3]. Search filters aim to maximize the retrieval of records sharing this common feature (recall) and to minimize the retrieval of records that do not

share it (precision). Filters are tested using a gold-standard set of records known to contain that common feature [4]. One method of creating a gold-standard set is hand searching to identify relevant papers that the filter should retrieve. An efficient alternative approach is relative recall, which involves pooling papers found during previous searches that are known to represent the common feature of interest to the filter [5].

The filters we present here have been developed for the MEDLINE and Embase databases using the Ovid platform [6, 7]. We expect these search filters will be used in combination with search terms to describe the management and treatment interventions of interest, such as drugs, devices, surgical procedures and other therapeutics.

Purpose of the Paper

The search filters originate in the work we did to support the National Institute for Health and Care Excellence (NICE) in developing rapid evidence-based guidelines for the United Kingdom (UK). The draft search filters tested in this paper were taken from the most recent versions in use at NICE. The development process, showing how the filters evolved, is summarized in Appendix A.

NICE uses the best available evidence to develop recommendations on a range of health and social care topics [8]. In March and April 2020, NICE produced 21 rapid guidelines on identifying symptoms and complications of COVID-19, therapeutic interventions, protecting people with clinically vulnerable conditions and managing health services [9]. The rapid guidelines were maintained using weekly surveillance searches until April 2023. The search strategies were developed specifically for the NICE remit of treating and managing COVID-19. The strategies also required maintenance throughout that period.

The purpose of this paper is to report on how we finalized the draft strategies and validated them as search filters. In June 2021, we published a preprint with a detailed description of the development process [10]. We intended the preprint to be an interim publication to meet an urgent need during a public health emergency, as a way of encouraging information specialists to collaborate [11]. We did not feel it was appropriate to do validation while new terminology and concepts relating to COVID-19 were still emerging. Since then, the information landscape has changed, and it is appropriate to undertake this validation.

Developing the Search Strategies for NICE

We created version 1 of the search strategies on March 16, 2020, and developed them iteratively during the subsequent weeks to support the rapid guidelines. There had not been any agreed terminology until February 2020 when the World Health Organization (WHO) named the condition "COVID-19" and the virus causing it "SARS-CoV-2" [12]. It took time for the WHO naming conventions to be used in the literature and we needed to account for new and changing terminology during this period of the pandemic. We adopted the concept of the "living search strategy" and kept the search terms we were using under continual review [13].

We kept the search strategies up to date with regular testing. We made modifications in spring 2021, when Ovid updated the Medical Subject Headings (MeSH) available in MEDLINE and the Emtree thesaurus in Embase. Adding the new subject headings for COVID-19 and SARS-CoV-2 meant we could rationalize the free-text terms we used in the search strategies (see Appendix B for terms we have not included in the final filters). The objective testing we carried out for each free-text term was

fully reported in the preprint [10]. Our testing showed that we would not miss any records relevant to NICE, while the improved precision meant we would have fewer irrelevant records to review, as we kept the rapid guidelines up to date. We published these results as version 10 in the preprint in June 2021 [10].

In April 2023, we created version 12 by adding free-text terms and subject headings to retrieve records relating to the Omicron variant of SARS-CoV-2 [14]. We were retrieving records on Delta and other Variants of Interest (VOI) or Variants of Concern (VOC) without needing to make further modifications. Details on how we accounted for earlier variants are available in Appendix A and Appendix B.

We have used version 12 of the search strategies as the draft search filters in this paper. We have not reported the three-year development period as that has been covered elsewhere [10]. In Appendix C to this paper we have provided a list and description of the online-only supporting materials that we have made available through Open Science Framework (OSF). These supporting files provide the data and search strategies we used in testing and validating the filters. As listed in Appendix C, online-only supporting File A in OSF provides the full search strategies for each version of the filters.

Alternative COVID-19 Search Approaches

We are not aware of any other validated search filters on COVID-19 or SARS-CoV-2. No validated search filters were listed on the Information Specialists' Subgroup (ISSG) Search Filter Resource on December 18, 2023 [15].

We are aware of several search strategies designed for PubMed, eight of which were tested prior to May 2020 [16]. The most sensitive strategy had a recall of 98.7%, although it would need to be adapted to the Ovid platform [13]. It is unclear how changes in terminology will have affected performance of these strategies.

Study-based registers became an important way to access evidence on COVID-19. These registers are usually open access, collating records from several sources to give users a single point of entry to the literature [17]. Reviews of COVID-19 study-based registers, including the Cochrane COVID-19 Study Register [18] and Epistemonikos COVID-19 L.OVE [19], have found them to be sufficiently comprehensive and up to date for use in systematic reviews [20–22]. The Study Classifier used to maintain the Cochrane COVID-19 Study Register had recall of 98.9% and precision of 63.8% [22]. These evaluations of study-based registers assessed their overall coverage and not the effectiveness of the individual search strategies they use on the various databases.

While we found study-based registers useful for the rapid NICE guidelines, it was still necessary to use our own search strategies. The functionality of the registers meant

that they could not wholly replace separate searches of each database. For example, we were running weekly searches throughout 2021-2023 for 100 pharmaceutical products for NICE, which required a saved search strategy with over 200 free-text terms, application of date limits, large exports of data and other features not available from the study-based registers. There is still a need for validated COVID-19 search filters for MEDLINE and Embase.

Aim and Objectives

The aim was to validate search filters to retrieve records from the Ovid versions of MEDLINE and Embase that are optimized for use in searches on treating and managing COVID-19.

The targets were 98.9% for recall and 64% for precision, to at least match the Cochrane COVID-19 Study Register [22].

The objectives were to:

- Test the draft search filters in MEDLINE and Embase and make any modifications.
- Collate a gold-standard set of records relevant to treating and managing COVID-19.
- Validate the draft search filters and calculate relative recall.
- Create an appropriate sample and use it to calculate the precision of the search filters.

METHODS

Definitions

We used the definitions in Figure 1 to set both the parameters of the filters and to make the screening decisions during testing. We used "relevance" in this context to mean a record that should be retrieved by a search (recall testing) or should not be retrieved (precision testing) for further assessment. We did not judge relevance according to whether the full text of a paper would be includable in a NICE rapid guideline.

The purpose of the filters is to retrieve records from the Ovid versions of MEDLINE and Embase about treating and managing COVID-19 in people of all ages in the community or in hospital. The filters are not optimized for retrieving records about diagnosis, prognosis, transmission, prevention, vaccination, mechanisms of action, epidemiology, or etiology. The filters are not validated for diagnosing, managing or treating secondary conditions caused by COVID-19, including long covid or post-COVID-19 syndrome.

Figure 1 Definitions used when testing and validating the search filters

Inclusions
Population
<ul style="list-style-type: none"> • People of all ages with suspected or confirmed COVID-19 caused by any variant of SARS-CoV-2: <ul style="list-style-type: none"> ○ including previously healthy people; ○ and all people with pre-existing conditions, such as cancers or mental health, cardiovascular, liver, dermatological, gastrointestinal, respiratory and renal illnesses.
Interventions and Comparators
<ul style="list-style-type: none"> • All interventions for treating COVID-19, including drugs, devices, surgical procedures and other therapeutics. • All interventions for managing the signs or symptoms of suspected or confirmed COVID-19 in the community or in hospital.
Outcomes
<ul style="list-style-type: none"> • All outcomes relating to mortality and morbidity of the population. • All impacts on the management, organization and delivery of health services.
Settings
<ul style="list-style-type: none"> • All home and social care settings. • All primary and secondary healthcare settings, including general practice, critical care, radiotherapy, dialysis, transplantation, radiotherapy, maternity, rehabilitation, palliative and chemotherapy services.
Study types
<ul style="list-style-type: none"> • Primary studies containing data that report any interventional or observational methods. • Evidence syntheses, including systematic reviews, meta-analysis, evidence maps, qualitative synthesis or rapid reviews.

- Health economics or cost effectiveness studies.
- Studies involving humans.
- In vitro studies reporting outcomes of interventions in relation to Variants of Interest or Variants of Concern.

Study formats

- Available in final, advanced (such as online-ahead-of-print) or preprint format.

Exclusions

- The effectiveness of vaccines for preventing COVID-19.
- The effectiveness of diagnostic or prognostic tests for COVID-19.
- General pandemic preparedness.
- The physical and mental health impacts of social distancing, lockdowns, face masks or other measures for preventing or reducing transmission of SARS-CoV-2 or other infectious diseases.
- Epidemiological studies, such as statistics or analysis of transmission rates, incidence or prevalence of COVID-19.
- Animal experiments.
- Records not containing data, such as clinical trial protocols or empty trial registry entries.

records retrieved (expressed as a percentage) [23].

We recorded all the screening decisions in EPPI-Reviewer version 5 (EPPI-R5). We undertook the MEDLINE tests in MEDLINE ALL, which is the Ovid-recommended method to access MEDLINE, Epub Ahead of Print, In Process & In Data Review Citations, and the other segments [7]. We carried out the Embase tests in the segment with a start date of 1974 [6].

Recall Test 1: Set Obtained from Butcher et al.

The first recall test used the set collated for a published article assessing the completeness of COVID-19 study-based registers [24]. Butcher et al. had identified systematic reviews meeting their criteria from Epistemonikos COVID-19 L.OVE, from which they extracted primary studies. We chose this test set as it was collated by a separate, independent research team and their methods had already been peer reviewed. The methods they used to collate their test set have been fully reported [24].

We received an Excel spreadsheet from the lead author of the study listing their test set (see File E in our online-only supporting materials posted to OSF). We cleaned the data for use in our own test and removed duplicates. We removed any grey literature reports that were not indexed on MEDLINE or Embase. We checked the preprints listed in the test set to see if a later, peer-reviewed, article had been published. We did this by checking the preprint on medRxiv or bioRxiv for links to a later article, then, where these did not exist, we searched for title words and authors in Ovid. When we identified later articles, we added these alongside the original preprints in order to update the test set. We created a new search strategy in Ovid for the test set using the Digital Object Identifier (DOI) where already known or the title. We combined the draft COVID-19 search filters with the test set in Ovid and recorded which items were retrieved (see OSF supporting Files B and C for details).

Recall Test 2: Updated Supplementary Sets

We used a second recall test to assess the draft search filters with a more up-to-date set of papers. As the test set from Butcher et al. had been collated in late 2020, it did not cover the variants of interest or concern that emerged afterwards. We followed a similar process to be consistent with the first test. We applied the category "Prevention and Treatment" in Epistemonikos L.OVE to identify relevant systematic reviews on COVID-19. We searched within these, using the title, abstract, author, and journal fields for the terms: "delta" or "variants of concern" or "variant of concern" or "variants of interest" or "variant of interest" or "omicron."

We screened the remaining records according to our criteria in Figure 1 to remove the prevention and epidemiology reviews.

Testing to Finalize the Draft COVID-19 Search Filters

We undertook four tests to finalize and validate the draft COVID-19 search filters: two to check recall, one for precision and one to test the relative recall of the gold-standard set.

Recall, also known as sensitivity, is:

- the proportion of available, relevant results that a search filter retrieves.
- calculated as the number of relevant records retrieved, divided by the total number of relevant records in the test set (expressed as a percentage).

Precision is:

- the proportion of records retrieved by a search filter that are relevant.
- calculated as the number of relevant records retrieved, divided by the total number of

We used citationchaser to identify the reference lists from the reviews we selected from our Epistemonikos search. Citationchaser is a free and open-source Shiny app that uses data from The Lens.org to conduct citation searching [25]. We extracted the DOI for each review and pasted the list into citationchaser. We downloaded the reference lists from citationchaser as RIS files, uploaded them to EPPI-R5, removed duplicates and screened the results according to the definitions in Figure 1. Both authors (who had been making decisions on relevance for these strategies for three years at this point) did the screening independently. We reconciled any discrepancies through discussion.

We had two new test sets, comprising the systematic reviews from Epistemonikos and the relevant primary studies obtained from their reference lists. We identified these items in Ovid using the DOI field, which we extracted from the citationchaser records (see OSF supporting File F). We combined the draft search filters with these test sets in Ovid and recorded which items were retrieved.

Precision Test

As the draft search filters would retrieve over half a million results from each database, we needed to download a sample to ensure we could feasibly complete the screening with the time and resources available. We needed a sample that would reflect the changing terminology from 2020 to 2023. There were also long periods when each variant of interest or concern would not have been referred to in the literature. Given the need to account for these factors, a targeted sample was more useful than a random sample.

We decided to download all the results from our draft search filters that had been added to MEDLINE and Embase on a single calendar day. We could then download all records from that day in 2020, 2021, 2022 and 2023, giving us a sample from throughout the pandemic. As Ovid only adds records to the databases from Monday to Friday, the date chosen needed to have been a working day in each of the four years. The day needed to be after February 22nd, to account for when WHO named COVID-19 in 2020. It also needed to be a day that had already passed in 2023 so that records would be available for the test.

We ran the draft search filters in Ovid and limited them to the relevant four dates. We used the fields Create Date (.dt) and Entry Date (.ed) in MEDLINE and Date Created (.dc) in Embase to generate the sample. We dual screened the records for relevance to COVID-19 and SARS-CoV-2 in EPPI-R5 (see OSF supporting Files G and H). We deduplicated the results to calculate a combined precision figure, as, in practice, both databases would normally be used in a literature search.

We collated the records that we had marked as not relevant from the deduplicated set (see OSF supporting

File I). We added the titles and abstracts of these records to the word and phrase counters freely available at <www.rapidtables.com>. We ran the counters to identify whether the irrelevant records contained any frequently occurring single words or two-word or three-word phrases (see OSF supporting File J). We assessed whether the words or phrases frequently appearing in the irrelevant records could be excluded from the draft search filters to make them more precise (as demonstrated in Figure 2, where we use the NOT operator to make Line 3 more precise).

Validation

We validated the search filters by testing the relative recall of a gold-standard set of records that we had not previously seen. We had used internal NICE data from the rapid guidelines to develop the draft search filters, therefore, we needed to collate a new gold-standard set to prevent biased results.

We created the gold-standard set by using the Cochrane COVID-19 Study Register [18]; a source we knew contained reliable and comprehensive evidence on COVID-19 [20, 22]. Cochrane used a range of sources rather than a single search strategy to collate the Study Register, which meant we would obtain a set that could be used in both MEDLINE and Embase. We knew that Cochrane had assessed the relevance of the studies to COVID-19 and so they would be appropriate for our gold-standard set [22]. This method meant we could create a much larger set than if we hand searched for relevant records [5].

We applied the "Treatment and Management" subject filter and the "Journal Article" study-type filter in the Cochrane COVID-19 Study Register. We downloaded all the results into CSV files. The export limit meant we had to do this in batches, with results limited by year of creation. We collated a master list from the CSV files in Excel and cleaned the data. We removed the clinical trial registry records, so that we retained articles and preprints. We extracted identifying numbers from Excel, including PubMed ID (.ui), DOI (.do) or Embase Accession Number (.an) and searched for these in Ovid. Where no number was available, we searched by title. We used these methods to ensure our Embase gold-standard set covered the records that Cochrane had obtained from MEDLINE or other sources.

We ran searches for the gold-standard set in Ovid, downloaded RIS files and imported them to EPPI-R5, where we removed any duplicates. We did further data cleansing to remove obviously irrelevant records, such as where numerous records were retrieved because the same DOI was applied to all conference papers published in a single journal supplement (ensuring we retained the one record of relevance).

We exported the PubMed ID field from EPPI-R5 in batches of 1000. We converted these lists of ID numbers into Ovid search strategies, which we pasted into MEDLINE. We ran our draft COVID-19 search filter. We used the search format "Gold standard AND Draft search filter" in Ovid to test recall and we used "Gold standard NOT Draft search filter" to identify any records we would miss. We followed the same process with Embase, having collated the accession numbers for the gold-standard set into an Ovid search strategy. We collated the records missed by the filters and tabulated their characteristics. The search strategies for the validation tests are available in supporting Files B and C, while the gold-standard sets are available in supporting Files K and L on OSF.

RESULTS

Testing to Finalize the Draft COVID-19 Search Filters

Recall Test 1: Set Obtained from Butcher et al.

The lead author sent us a list of 440 records that had been used for the completeness test in their original article [24]. Four of these records were grey literature reports that we could not identify in MEDLINE or Embase on April 17, 2023. We removed three duplicates from the list. We identified that 30 of the 440 records were preprints and established that 16 of these had later articles associated with them. Our final test set comprised 449 records.

We ran the tests on April 24, 2023, using the Ovid segments dated April 21, 2023. Our draft search filters retrieved 409 of the 411 records available on MEDLINE and 392 of the 394 available on Embase, giving us a recall rate of 99.5% in both databases (see Table 1).

The draft search filters missed the same two records in both databases (see OSF supporting File E). We examined the free text and subject headings of these records. One paper was about endocarditis [26] and the other was about Gitelman syndrome [27]. We decided that these papers did not meet our screening criteria in Figure 1, despite being in the COVID-19 test set from Butcher et al. [24]. We did not alter our draft search filters, as we had already exceeded our recall target of 98.9%.

Table 1 Performance of the draft search filters in recall test 1 with the test set obtained from Butcher et al. (April 24, 2023).

Test set	MEDLINE	Embase
No. in test set	449	449
No. available on database	411	394
No. retrieved by filter	409	392
Percentage of those available retrieved by filter	99.5%	99.5%

Recall Test 2: Updated Supplementary Sets

On April 19, 2023, Epistemonikos L.OVE contained 15,056 systematic reviews and 7679 of these were tagged with "Prevention or Treatment". We searched within these for the terms relating to variants listed above and found 116 results. We screened the 116 records and included 33 and excluded 83 of these systematic reviews. We found that 30 of the 33 reviews were available on citationchaser and that these had a combined total of 1484 records in their reference lists. We downloaded a RIS file containing the papers in these references lists. In EPPI-R5 we removed 41 duplicates and dual screened the remaining 1443 records according to the criteria in Figure 1. From this screening, we identified 1049 records that we could use in the supplementary test set of primary studies (see OSF supporting File F).

We ran the test on April 25, 2023, using the Ovid segments dated April 24, 2023. We found our draft search filters had 100% recall of the systematic reviews, with 27 available on MEDLINE and all 33 available on Embase (see Table 2). We ran the primary studies test and the draft search filters retrieved 924 of the 927 available on MEDLINE (99.7%) and 949 of the 951 available on Embase (99.8%).

We examined the four different records we missed: there were three in MEDLINE [28–30] and two in Embase [29,31] (see also OSF supporting File F). We found that none of the four had abstracts, only one had subject headings and three were letters. It was not possible to retrieve these records without adversely affecting precision. For example, two could only be retrieved by searching for the drug name "molnupiravir" [29,31] (at a time NICE was monitoring over 100 pharmaceutical products). Again, we had exceeded our recall target of 98.9% and so we moved to our next test without making further changes to the draft search filters.

Table 2 Performance of the draft search filters in recall test 2 with the updated supplementary sets (April 25, 2023).

Category	Test set	MEDLINE	Embase
Systematic reviews	No. in test set	33	33
	No. available on database	27	33
	No. retrieved by filter	27	33
	Percentage of those available retrieved by filter	100%	100%
Primary studies	No. in test set	1049	1049
	No. available on database	927	951
	No. retrieved by filter	924	949

	Percentage of those available retrieved by filter	99.7%	99.8%
Total test set	No. in test set	1082	1082
	No. available on database	954	984
	No. retrieved by filter	951	982
	Percentage of those available retrieved by filter	99.7%	99.8%

Precision Test

We chose the date of April 28 for the precision test as it had been a working day each year from 2020-2023. We ran the test on May 4, 2023, using the Ovid segments for May 3, 2023. The draft search filter had 354,166 results in MEDLINE, of which 2633 had been added on April 28 in 2020-2023. The draft Embase filter had 454,578 results and we downloaded the 712 that had been added on April 28 each year. We verified that records were added to both databases for each year of the test period. We uploaded the samples to EPPI-R5 for screening. We created a combined file, from which we removed 72 duplicates, to leave 3273 records for the overall test of precision (see Table 3).

We found that the draft search filters had a precision of 91.2% in MEDLINE and 90.3% in Embase (see Table 3). In the overall test of the deduplicated sample, we found that 2982 records (91.1%) were relevant and 291 (8.9%) were not relevant (see Table 3). The 291 irrelevant records included 26 (0.8% of the total) that were about other coronaviruses (such as Middle East Respiratory Syndrome (MERS)) but not COVID-19. We had found during development that we needed to include the free-text term "coronavirus" (as it is part of the name "Coronavirus Disease 2019") and we did not want to harm recall by removing it.

The other 265 irrelevant records (8.1% of the total) in the deduplicated sample included a number of papers that referred to the COVID-19 pandemic, although they were not relevant to our criteria in Figure 1. For example, we excluded a review of how students adapted to online learning during COVID-19 lockdowns.

We added the titles and abstracts of the 291 excluded articles to <www.rapidtables.com> on May 17, 2023, and sorted the resulting words and phrases according to the number of occurrences. After eliminating terms referring to study types, such as "scoping review" and "case study", the most frequent two-word phrase occurring was "covid pandemic", which appeared five times in the titles and 135 times in the abstracts. The most frequent three-word phrase was "post pandemic era", occurring just twice in

the 291 abstracts (see OSF supporting File J). We did not pursue further modifications to the draft search filters, as these phrases could not be excluded without adversely affecting recall.

We exceeded our target of 64% for precision in both databases and in the overall test of deduplicated records. We proceeded to validation without making further changes to the draft search filters.

Table 3 Performance of the draft search filters in the precision test (May 4, 2023).

Screening decision	No. downloaded from MEDLINE		No. downloaded from Embase		Total after deduplication	
	Number	Percentage	Number	Percentage	Number	Percentage
Include: Relevant to COVID-19 or SARS-CoV-2	2402	91.2%	643	90.3%	2982	91.1%
Exclude: Relevant to other coronaviruses	24	0.9%	2	0.3%	26	0.8%
Exclude: Not relevant	207	7.9%	67	9.4%	265	8.1%
Total in test set	2633	100%	712	100%	3273	100%

Validation

To validate the draft search filters, we downloaded records for the gold-standard set from the Cochrane COVID-19 Study Register on May 3, 2023. The Study Register contained 224,665 records in total, of which 28,884 were labelled as "Treatment and Management", including 22,074 categorized as "Journal Articles". We downloaded all 22,074 records in four batches. Once we had removed duplicates and trial registry entries, the master list contained 20,739 records.

We searched for these 20,739 records in MEDLINE, using PubMed ID where available, DOI number if known, or title. This identified 14,963 records in MEDLINE on May 19, 2023, which we downloaded in RIS files for further processing in EPPI-R5. We removed 142 duplicates and cleansed the data, removing 196 obviously irrelevant records, such as those with errors in the DOI field. The MEDLINE gold-standard set had 14,625 records, which we exported from EPPI-R5 and converted to Ovid format using the PubMed ID field (see OSF supporting File B).

We followed a similar process for Embase, where we searched for the 20,739 records using the accession

number where available, then the DOI number, followed by title, if neither of those were available. We had 20,239 results on May 19, 2023. We imported these records into EPPI-R5, removing 491 duplicates and 377 obviously irrelevant records. We obtained the Embase accession numbers for the remaining 19,371 records and created an Ovid strategy to retrieve them (see OSF supporting File C).

We ran the gold-standard sets and combined them with the draft search filters on May 19, 2023, using the Ovid segments dated May 18, 2023, in both databases. In MEDLINE, the recall was 99.86%, with the filter finding 14,604 and missing 21 of the 14,625 records in the gold-standard set (see Table 4). The Embase filter achieved 99.88% recall, finding 19,348 and missing 23 records. Both recall figures exceeded our target for performance.

The validated filters are presented in Figure 2 and are also available in OSF supporting File M to encourage reuse.

Table 4 Relative recall when validating the filters (May 19, 2023).

Test set	MEDLINE	Embase
No. in gold-standard set	14625	19371
No. retrieved by filter	14604	19348
Percentage of those available retrieved by filter	99.86%	99.88%

Characteristics of the Missed Records

We found that the missed records would be of minimal importance to a literature search being conducted according to our definitions in Figure 1. The results are summarized in Table 5 (see OSF supporting Files K and L for the list of records and how we categorized them).

We found that corrections accounted for 13 records in MEDLINE, some of which only had the title "Erratum" (see Table 5). Five MEDLINE and 10 Embase records were about Multisystem Inflammatory Syndrome in Children (MIS-C) or Acute Respiratory Distress Syndrome (ARDS). One MEDLINE record had a spelling mistake in the title ("COVD-19") and did not have an abstract or any MeSH terms [32]. The 10 Embase records about COVID-19 were difficult to find using free text, as one had no title, one had a mistake in the title ("theCOVID-19"), 12 had no abstract and four were records in other languages that used Original Title (.ot) instead of the Title field. We only missed one full journal article about COVID-19 in MEDLINE and that was because the Ovid record had a publication date of 2019, when it had been published online in January 2021 [33]. The one remaining journal article in English missed in Embase referred only to "a pandemic" [34].

Table 5 Characteristics of the records from the gold-standard sets missed by the filters.

		MEDLINE	Embase
No. of records missed from the gold-standard set		21	23
Format	Conference abstract	0	2
	Correction	13	3
	Journal article	6	10
	Journal article - case report	0	3
	Letter	2	5
Topic of the article	ARDS or mechanical ventilation	1	2
	COVID-19	16	13
	MIS or MIS-C	4	8
Title of the article	Refers to COVID-19 correctly in title (.ti)	1	0
	Error in reference to COVID-19 in title (.ti)	1	1
	Refers to ARDS or dysfunction	0	2
	Refers to COVID-19 in original title (.ot)	1	4
	Refers to MIS-C	3	8
	Refers to pandemic	1	2
	Contains no terms relating to a condition	14	5
	No title in the Ovid record	0	1
Abstract	No abstract	19	12
	Does not refer to COVID-19	2	2
	Refers to ARDS or dysfunction	0	1
	Refers to MIS-C	0	7
	Refers to pandemic	0	1
Keyword headings	Refers to COVID-19, SARS-CoV-2 or coronavirus	6	3
	Refers to ARDS or dysfunction	0	2
	Refers to MIS-C	0	3
	None referring to COVID-19	0	3
	None	15	12
Language	English	19	16
	French	0	2
	German	1	1
	Norwegian	0	1
	Spanish	1	2
	Swedish	0	1
	2019	1	0

Year of publication in Ovid record	2020	3	8
	2021	11	10
	2022	6	3
	2023	0	2

Figure 2 The NICE MEDLINE and Embase (Ovid) search filters for treating and managing COVID-19.

<p>NICE Ovid MEDLINE filter for treating and managing COVID-19</p> <p>1 SARS-CoV-2/ or COVID-19/ or COVID-19 Drug Treatment/ or COVID-19 Serotherapy/ 2 (corona* adj1 (virus* or viral*)).ti,ab. 3 (CoV not (Coefficient* or "co-efficent*" or covalent* or Covington* or covariant* or covarianc* or "cut-off value*" or "cutoff value*" or "cut-off volume*" or "cutoff volume*" or "combined optimi?ation value*" or "central vessel trunk*" or CoVR or CoVS)).ti,ab. 4 (coronavirus* or 2019nCoV* or 19nCoV* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or SARSCoV2* or "SARS-CoV2*" or "severe acute respiratory syndrome*" or COVID*2).ti,ab. 5 omicron.ti,kf. 6 or/1-5 7 limit 6 to yr="2020-Current"</p>
<p>NICE Ovid Embase filter for treating and managing COVID-19</p> <p>1 exp severe acute respiratory syndrome coronavirus 2/ or coronavirus disease 2019/ or experimental coronavirus disease 2019/ 2 (corona* adj1 (virus* or viral*)).ti,ab. 3 (CoV not (Coefficient* or co-efficent* or covalent* or Covington* or covariant* or covarianc* or "cut-off value*" or "cutoff value*" or "cut-off volume*" or "cutoff volume*" or "combined optimi?ation value*" or "central vessel trunk*" or CoVR or CoVS)).ti,ab. 4 (coronavirus* or 2019nCoV* or 19nCoV* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or SARSCoV2* or "SARS-CoV2*" or "severe acute respiratory syndrome*" or COVID*2).ti,ab. 5 omicron.ti,kf. 6 or/1-5 7 limit 6 to yr="2020-Current"</p>
<p>Key</p> <p>/ = specifies the subject heading field exp = explodes the subject headings * = unlimited truncation retrieving all variations of the root word *2 = truncation limited to 2 characters following the root word ? = optional wildcard to substitute for one or no characters adjn = defined adjacency operator to retrieve records containing the search terms within a specified number of words from each other in any order "term" = used to specify the terms must occur as a phrase .ab = free-text terms in the abstract field .kf = keyword heading word field to search single words assigned by authors .ti = free-text terms in the title field .yr = year of publication field</p>

text terms (such as "2019nCoV" and "19nCoV") that were used before the WHO naming conventions were more widely adopted. We have either removed or rejected a list of around 100 other words and phrases that would not improve recall, such as "SARS-CoV-2019" or "nCoV2019" (see the full list in Appendix B). The filters could miss some papers published in January 2020 that identified the initial outbreak in Wuhan, although it is unlikely these would refer to treating or managing COVID-19.

It is important to keep the filters up to date, testing new terminology (e.g. variants of interest or concern) and subject headings. The filters exceed our recall targets without having to include free-text terms referring to "Delta" or the earlier variants. We did have to include title and keyword searches for the term "Omicron" to maintain recall. The Keyword Heading Word field is useful because it is populated by the authors of the studies, who are likely to name a new variant before it has been included in MeSH or Emtree. In the Embase filter, we have exploded the subject heading "Severe acute respiratory syndrome coronavirus 2" to ensure it retrieves any new, as yet unnamed, variants as soon as they are added to Emtree. The MEDLINE filter is more stable, as the subject heading "SARS-CoV-2" is currently used for all variants without having any narrower headings.

The timing of any subsequent updates to the search filters is difficult to predict, as testing cannot take place as soon as WHO identifies a new variant of interest or concern. We need to wait until the variant is discussed in the literature and then keep the terms under review to assess the impact on recall. It also takes time for new subject headings to be added into MeSH and Emtree and for these to be made available in Ovid. We may need to expand the free text in the early stages after a new variant is identified, before making later versions of the filters more precise, once the subject headings have been updated.

Coverage of Other Pandemics and Coronaviruses

It can be difficult to distinguish between articles that are about COVID-19 and those that are referring to events that occurred during the pandemic. We found that abstracts referring to events that happened "during the pandemic" were not usually about treating or managing COVID-19. Our filters do not cover general pandemic preparedness, as this may include other diseases, such as influenza. Our filters were already achieving their target for recall and so we did not alter them to retrieve more of these general "pandemic preparedness" records, which would have also reduced precision.

We are aware from the precision test (see Table 3) that the filters do retrieve records about other coronaviruses. We chose not to make the filters more precise as we did not want to exclude records comparing coronaviruses, such as a review of treatments for COVID-19, MERS and SARS. We also chose subject headings specific to COVID-19 and

DISCUSSION

Keeping the Search Filters up to Date

The filters incorporate a range of free-text terms and subject headings. We have only included free-text terms that add value to the filters. The filters retain some free-

SARS-CoV-2 from lower in the MeSH and Emtree hierarchies to avoid retrieving records about feline coronavirus, porcine delta coronavirus or other coronaviruses outside of our definitions in Figure 1. We included a date limit in the filters to minimize the retrieval of records about other coronaviruses that were published before January 2020.

Coverage of Conditions Secondary to COVID-19

We defined the parameters of the filters in Figure 1 to refer to the specific condition COVID-19. We chose not to expand the remit of the filters to cover conditions that are secondary to COVID-19, such as MIS-C, ARDS, cytokine storm or Kawasaki disease.

We felt that retrieving records on these secondary conditions could be done in one of two ways. Firstly, the filters already adequately retrieve records where the searcher is only interested in a condition when it is caused by COVID-19 (e.g. all records retrieved by "Cytokine storm AND COVID-19" would be found by the filters). Secondly, a comprehensive search for a disorder that can be triggered either by COVID-19 or another condition needs its own strategy and not a COVID-19 filter. For example, Vaccine Induced immune Thrombocytopenia and Thrombosis (VITT) ought to be searched in its own right, as it is not necessarily caused by a COVID-19 vaccine. Therefore, we did not expand our filters to increase recall of these secondary conditions.

Similarly, we decided that the filters should not cover post-COVID-19 syndrome (also known as long covid). We felt that searches to identify treatment and management strategies for this condition would need to be developed separately, rather than relying on a general COVID-19 filter.

Measures to Increase Recall

We found that 15 of the 21 records we missed in MEDLINE during validation and 8 of the 23 in Embase were letters or corrections (see Table 5). There was often no way of recognizing that these were relevant from the Ovid records, without reviewing the full text. This suggests that after screening search results it is worth following up the potentially includable studies for related letters, corrections, retractions, editorials or comments [35]. A quick way to do this for COVID-19 studies is to use the Cochrane COVID-19 Study Register, which helpfully links together the references to a study in a single record [18].

We have designed the filters to balance our recall and precision targets. It would be possible to increase recall, at the expense of precision, by increasing the number of fields used for the free text. We missed a small number of records because their titles were in the Original Title (.ot) field. We could also retrieve some of the missed records by extending our use of keyword headings to other lines

in the filters. The simplest way of making these changes would be to apply the Multi-Purpose field (.mp) to all of the free-text terms [6, 7].

We could also increase recall at the expense of precision by exploding more subject headings. We did not explode the Emtree term "Coronavirus disease 2019" in the Embase filter, as doing so would retrieve headings on a number of related conditions, including long covid, VITT and MIS-C. We have not tested how these changes affect precision, since our current filters exceed 99% recall.

LIMITATIONS

We acknowledge that the search filters have been validated for use in searches requiring evidence on drugs, devices, surgical procedures and other therapeutics. We have not tested the recall of records about diagnosis, prognosis, transmission, prevention, vaccination, mechanisms of action, epidemiology or etiology. The filters are not suitable for searching for related conditions caused by COVID-19, as we have not included the subject headings required for these.

The first test set for recall was derived from another study but this had already been peer reviewed [24]. We also took steps to update the test set obtained from Butcher et al. to ensure coverage of later papers and variants of SARS-CoV-2.

We were reliant on the Cochrane COVID-19 Study Register when creating our gold-standard set. As Cochrane compile the Study Register by searching several sources, we were testing our filters against a broad range of COVID-19 studies, rather than just comparing the filters to the search strategies that Cochrane use on individual databases. We also knew that the Study Register had 94.4% coverage of interventional studies in November 2020 [20]. We could rely on the papers in the Study Register being relevant to our gold-standard set because Cochrane assess their search results using a validated machine-learning classifier that has a recall rate of 98.9% [22]. The search and classification methods used for the Cochrane Study Register have been quality assured for maximum sensitivity of human studies and they are transparent, rigorous and high performing [20, 22]. We are confident that our gold-standard set accurately represents a sample of relevant literature on treating and managing COVID-19. We were able to obtain a much larger set than if we had hand searched for relevant records to include in the gold standard [5].

We noted in the discussion of the precision tests that papers referring to events that occurred "during the pandemic" will often refer to COVID-19 and be retrieved by these filters. The filters are only intended to retrieve records referring to people with diagnosed or suspected COVID-19.

CONCLUSIONS

We have optimized the search filters for use in the Ovid versions of MEDLINE and Embase when needing to retrieve records about treating and managing COVID-19. We set targets of 98.9% for recall and 64% for precision. In the first recall test, both filters had 99.5% recall. In the second test, recall increased to 99.7% and 99.8% in MEDLINE and Embase respectively. The filters had a precision of 91.1% in a deduplicated sample of records. In validation, we found the MEDLINE filter had relative recall of 99.86% (finding 14,604 of the 14,625 records in the gold-standard set) and the Embase filter had 99.88% relative recall (finding 19,348 of 19,371 records). As with all search filters, there will be an ongoing need to keep them up to date by reviewing the free-text terms, subject headings and fields included. The validated search filters can be used in literature searches about treating and managing COVID-19.

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DATA AVAILABILITY STATEMENT

Data associated with this article are available in the Open Science Framework at <https://osf.io/hwgke/>.

AUTHOR CONTRIBUTIONS STATEMENT

Note: the authors contributed equally to all stages of this study. Paul Levay: conceptualization; data curation; formal analysis; investigation; methodology; project administration; validation; writing – original draft; writing – review & editing. Amy Finnegan: conceptualization; data curation; formal analysis; investigation; methodology; project administration; validation; writing – original draft; writing – review & editing.

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SUPPLEMENTAL FILES

- **Appendix A:** Version history for the NICE search filters for treating and managing COVID-19
- **Appendix B:** List of free-text terms considered during development of the filters
- **Appendix C:** Description of the online-only supporting materials available from Open Science Framework (OSF)

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Exploring librarians' practices when teaching advanced searching for knowledge synthesis: results from an online survey

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Objective: There is little research available regarding the instructional practices of librarians who support students completing knowledge synthesis projects. This study addresses this research gap by identifying the topics taught, approaches, and resources that academic health sciences librarians employ when teaching students how to conduct comprehensive searches for knowledge synthesis projects in group settings.

Methods: This study applies an exploratory-descriptive design using online survey data collection. The final survey instrument included 31 open, closed, and frequency-style questions.

Results: The survey received responses from 114 participants, 74 of whom met the target population. Some key results include shared motivations to teach in groups, including student learning and curriculum requirements, as well as popular types of instruction such as single session seminars, and teaching techniques, such as lectures and live demos.

Conclusion: This research demonstrates the scope and coverage of librarian-led training in the knowledge synthesis research landscape. Although searching related topics such as Boolean logic were the most frequent, librarians report teaching throughout the review process like methods and reporting. Live demos and lectures were the most reported approaches to teaching, whereas gamification or student-driven learning were used rarely. Our results suggest that librarian's application of formal pedagogical approaches while teaching knowledge synthesis may be under-utilized, as most respondents did not report using any formal instructional framework.

Keywords: Evidence Synthesis; teaching strategies; Literature Searching



See end of article for supplemental content.

INTRODUCTION

In health sciences, early career researchers and students are frequently encouraged to conduct knowledge synthesis (KS) reviews to situate their research program in the context of what has previously been done, to gain an understanding of the research process, to increase critical appraisal skills, and to fulfill academic requirements [1-3]. While narrative review articles can serve these purposes appropriately, previous work has questioned the appropriateness of the increasing number of graduate theses that include a systematic review as part of the academic output [4-7].

While learners are frequently prompted to pursue reviews by faculty members, sometimes those faculty do not have the skills or experience to mentor the students through the learning process. In such cases, students must learn the

methods on their own and seek out the necessary guidance. Novice reviewers can learn how to plan out their review by reading about the methods in articles and handbooks, watching video tutorials, providing research assistance with a more experienced review team, participating in courses or workshops, or any combination of these strategies [8, 9].

In addition to formal learning opportunities and self-directed learning, students may receive guidance from methodological experts, including academic health sciences librarians. Novice reviewers frequently consult librarians for their search expertise [10]. Many librarians also provide support for other aspects of conducting and writing the review, including advice on refining the review question, instruction on the appropriate choice of review methodology, and guidance on data management issues [11, 12]. Wissinger commented on a perceived

increase in contact between librarians and students participating on review teams, as well as the challenges involved when learners undertake their own systematic review projects [7].

There have been several recent reviews regarding both online and in-person SR training opportunities. These reviews summarize the in-person or blended training that has been reported in the literature up to 2020 [13] and the web-based courses, tutorials, and videos available in 2015 [9]. A wide variety of teaching interventions have been reported, such as instructional sessions with or without supplemental learning through web-based tutorials, homework, or follow-up [14,15]. There have also been several published program descriptions or educational evaluations that report that academic librarians have been offering a range of SR searching instructional support for trainees [13–20].

Searching for evidence to include in SRs involves unique skills that correspond with, but do not exactly mirror, fundamental information literacy (IL) skills for general information retrieval nor evidence-based practice (EBP) skills of finding, evaluating, and integrating research evidence into clinical practice. There is extensive literature on the instruction efforts related to both former constructs, as demonstrated by systematic reviews on librarian-led IL and EBP instruction [21–23]. Examples also exist of research on the impact of library instruction on systematic searching skills [23] and academic research projects generally [24], showing positive correlations regardless of format or evaluation methods [25–26].

Individual case reports published across the literature provide some evidence of the impact of several models of library instruction on learner satisfaction and searching abilities, yet do not provide a broader depiction of librarian's teaching practices for comprehensive searching. For example, Premji et al.'s scoping review of knowledge synthesis instruction integrates librarians with a broader pool of KS instructors, while also excluding online education initiatives and didactics focused specifically on a single step (e.g. searching) of the review process [13]. Therefore, the cross-sectional summary of knowledge synthesis instruction as of 2021 gives an incomplete picture of librarian contributions to instruction in this domain. Meanwhile, there have been no investigations of the instructional practices of librarians across institutions in support of SRs and other comprehensive reviews, suggesting a gap in our understanding of teaching practices, content covered, and instructional formats of librarians when supporting trainees to search comprehensively.

With this study, we aimed to address this gap by surveying librarians to inventory the teaching practices used with groups of learners and answer the following research question: What are the teaching practices, content covered in instructional sessions, and resources used

when academic health librarians teach groups of students comprehensive searching as needed for KS projects?

METHODS

We conducted an exploratory-descriptive study using online survey data collection. The survey instrument can be found in Appendix A. A positionality statement outlining the researchers in relation to the context of the study can be found in Appendix B.

Survey Development

An online survey was developed in SurveyMonkey. A first draft of the survey instrument was initially developed by two authors and then finalized by all authors. The survey questions were designed to collect non-identifying demographic data, to gather information regarding pedagogical approaches used when teaching, and to understand scope of content covered. The options for questions involving multiple choice selection were generated using a combination of author's subject expertise and targeted reviews of the literature. Recognizing that not all options could be pre-determined, each question included an "other" response option.

Ethics approval was obtained by the University of Toronto ethics review board in June 2022 (REB #43095). The survey was pilot tested by four individuals from different academic institutions, who were familiar with the subject matter and survey methodologies. The feedback from the pilot test was synthesized, and the survey items were modified accordingly. The survey instrument was finalized following the pilot test to include 31 open-ended and closed-ended (numerical range, categorical, and matrix scale) questions as described below. To avoid contributing to survey fatigue prior to collecting data related to our research questions, demographics questions unrelated to the inclusion criteria were asked at the end of the survey [28].

Population

Branching logic was used to identify the respondents that met the elements of our population of interest which was health sciences librarians. Additional eligibility questions screened in respondents that 1) teach comprehensive searching for knowledge synthesis projects in 2) group settings.

The first two questions identified whether respondents met our base population. A librarian was defined as an individual who holds an MLIS, MI, or equivalent and was employed in a position where holding one of these degrees is required. Health sciences was defined as engaging with students in a degree program such as medicine, nursing, dentistry, public health, rehabilitation, kinesiology, pharmacy, or social work. Individuals not meeting these two elements were exited from the survey.

Next, participants were asked whether they teach comprehensive searching methods for knowledge synthesis projects. Comprehensive searching was defined as a reproducible and transparent search method that aims to identify every paper on a given research topic, accomplished through a search that is structured, operationalized, and executed using advanced features in a bibliographic database. Knowledge syntheses were defined as “the contextualization and integration of research findings of individual research studies within the larger body of knowledge on the topic” using reproducible and transparent methods [29]. Participants who selected ‘no’ or ‘unsure’ were asked to elaborate on why they were unsure and were then exited from the survey.

Finally, participants were asked whether they teach these topics in group settings. A group setting was defined as including 3 or more learners. Those who selected ‘no’ or ‘unsure’ were asked to explain why not or why they were unsure, then redirected to the demographic questions before exiting the survey.

The remaining participants represented our specific population of interest and were directed to answer the remaining 24 questions.

Survey Distribution

The survey opened in August 2022 and was distributed electronically by email. The recruitment email can be found in Appendix C. The survey was distributed to a variety of librarian association electronic listservs, including: EAHIL, MEDLIBS, CANMEDLIBS, KSIG, AFMC, CILIP, aliaHEALTH, and MARIMEDLIB. The survey was also distributed on Twitter and Facebook. All questions in the survey were optional, and participants could choose to leave the survey at any time. The survey was open for one month, with a reminder email being sent halfway through the recruitment period, following Dillman’s survey methodology for internet distribution [28].

Analysis

Results from the survey were exported from SurveyMonkey into Excel for analysis. Closed-ended questions were analyzed using descriptive statistics. For the questions that had a narrative response component, a code book was established using thematic analysis [30]. To create the code book, one author scanned the data and developed draft codes based on two open-ended question responses. The draft codes were then reviewed and finalized by all authors. Following this, two authors independently coded the open-ended questions using the developed codes from the code book. The research team then met to discuss major ideas and codes generated from each question and across the open text responses.

Results

The survey instrument including exact questions asked can be found in Appendix A. For clarity as to which questions are being reported in each section of the results, we have indicated the question numbers throughout.

Responses and Demographic Information (Questions 1, 2, 3, 4)

The survey received responses from a total of 114 participants, all of whom identified as a librarian. Of these, 105 respondents selected that they work with students in the health sciences. 90 respondents indicated that they teach comprehensive searching, but 16 of those did not report teaching the topic in a group setting. This left 74 respondents that met the target population of our survey, 57 of whom fully completed all questions. A schematic of this process can be found in Appendix D. The question response rate declined throughout the survey, so we have noted the response rate for each question throughout the results reported for the sake of clarity. We are not able to estimate the global number of academic health sciences librarians nor the number of recipients of the various means of distributing the invitation to participate, and therefore are unable to calculate a total response rate.

All respondents were asked to report on their length of career and country of employment. Respondents meeting all the inclusion criteria were also asked how long they had been teaching KS in group settings. These results are reported in Table 1.

Table 1 Responses to the length of career, country of employment, and years teaching KS in group settings (Questions 8, 21, 22).

Characteristic	All Respondents - no. (%)
Length of Career	n=69
1-5 years	9 (13)
6-10 years	14 (20)
11-15 years	12 (18)
Over 15 years	32 (46)
Country	n=68
Australia	2 (3)
Canada	33 (49)
Croatia	1 (1)
Ireland	2 (3)
Netherlands	2 (3)

New Zealand	1 (1)
Nigeria	1 (1)
Portugal	1 (1)
Spain	3 (4)
Sweden	4 (6)
Switzerland	1 (1)
United States	11 (16)
United Kingdom	6 (9)
Years Teaching KS	n=64
Less than 1 year	6 (9)
1-5 years	27 (42)
6-10 years	14 (22)
11-15 years	6 (9)
Over 15 years	11(17)

Barriers and Motivations (Questions 3A, 4A, 5)

From the 102 respondents who reported that they are health sciences librarians, 9 reported that they do not teach comprehensive searching as defined for this study and 3 responded they were unsure. In an open-ended question, they were asked why not, or why they were unsure. The most common responses were lack of support available at their institution, time limitations, and that this task did not fall within their job responsibilities. As they did not meet the inclusion criteria, these 12 individuals were then exited from the survey and no further data collected.

In an open-ended question, the remaining respondents were asked to provide one to three reasons why they teach comprehensive searching methods for KS in group settings. 151 responses from 63 respondents were coded using the coding dictionary. The most common codes selected were curriculum, student learning, and logistics. A summary of the frequency of codes, example responses, and code definitions can be found in Appendix E.

Frequency and Group Size (Questions 6 and 7)

The majority (56%; n=36) of 64 respondents indicated they deliver a group workshop for knowledge synthesis searching 2 to 5 times a year. The total number of participants taught over the course of a typical year varied, with 17% (n=11) of librarians reporting 3 to 10

participants, 38% (n=24) reporting 11 to 50 participants, 25% (n=16) reporting 51 to 100 participants, and 17% (n=11) reporting 101 to 500 individuals. One respondent indicated they taught more than 500 individuals in a year.

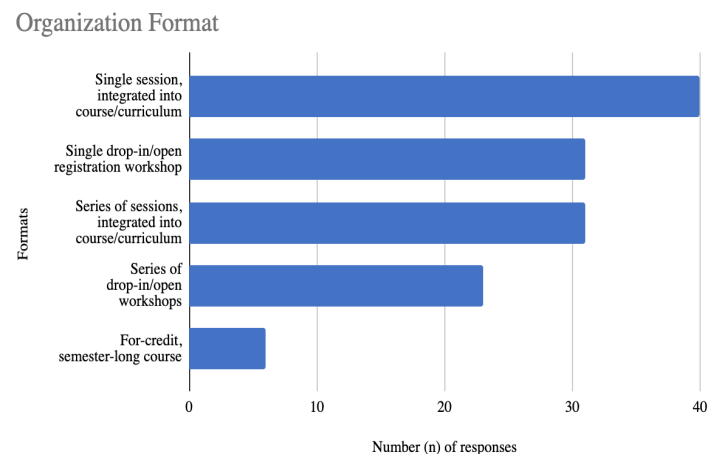
Locations and Format (Questions 9, 10, 13)

When asked about location, the majority of the 63 respondents teach online (87%, n=54), followed by in-person (79%, n=49) and hybrid (45%, n=28). An open text "other" response was also provided, where several respondents noted that the pandemic had impacted the locations where they teach, with more instruction occurring online than previously.

Respondents were also asked which formats they teach in. The majority of the 64 respondents (97%, n=57) teach completely synchronously. 46% (n = 29) teach using a mix of synchronous and asynchronous methods, and 17% (n=11) teach entirely asynchronously.

Respondents were also asked how they organize the delivery of their instruction. The most common selection by the 62 respondents was a single session, integrated into a course or curriculum (67%, n = 40). Additional results can be seen in Figure 1. Most respondents indicated they taught in more than one type of format (66%, n = 41/62, range 1 - 5, average = 2.22).

Figure 1 Quantitative responses to the question: What organization format do you use when teaching comprehensive searching methods for KS in group settings? Select all that apply.



Tools and Activities (Questions 11, 12)

Respondents were asked to select which tools and activities they use to teach comprehensive searching in group settings. 15 options were provided, and respondents were asked to choose the frequency at which

they used the tool or activity using the options of Not at all, Rarely, Occasionally/Sometimes, and Always. Live demonstrations were reported Always used by 87% (n=53) of the 62 respondents that answered, and this option had no responses for “Not at all”. More than 50% of responding librarians indicated they also always used lectures, class discussions, and online research guides. Additional results can be seen in Figure 2. 17 respondents gave other examples of teaching strategies, from storytelling to specific exercises or assignments, which are reported in Appendix F.

Topics (Question 14)

A variety of questions were asked regarding the specific elements taught, as well as how those elements are integrated into teaching. Respondents were given a list of 32 topics and asked whether they include it in their sessions. All 32 topics were selected at least once. The most common topics covered were Boolean operators (100%, n = 56), database selection, synonym generation, controlled vocabulary, and executing a database search (98%, n = 55). Appendix G illustrates additional results regarding the frequency of respondents who cover each of the topics, sorted in order of most frequent to least.

For each topic, 56 respondents were also asked how they integrate the topic into their teaching to gather impressions of which topics were covered by a range of didactic, self-directed, and active learning strategies. Of note, four of the five search topics noted above are also the topics with the most dynamic teaching approaches reported. Full results are presented in Table 2.

Figure 2 Responses to the question: In preparing for, delivering, or following up on group instructional sessions, how often do you use the following tools and activities to teach comprehensive searching methods for KS?

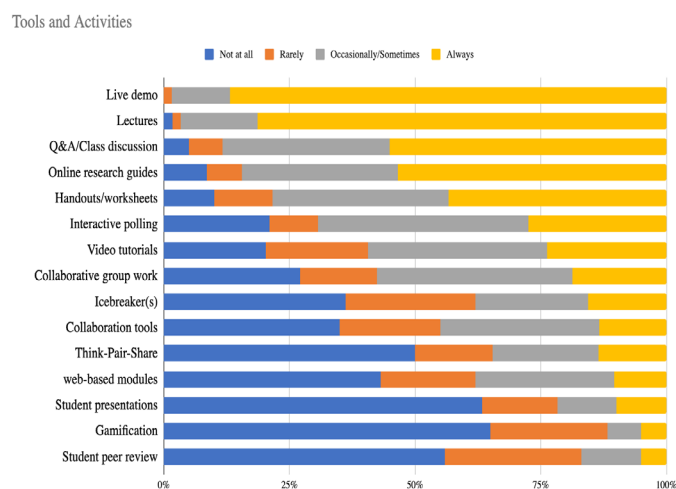


Table 2 Illustrates how different topics are included when teaching comprehensive search methods for KS in group settings. Results are presented on a colour spectrum with red being the least frequent, yellow being the median, and blue being the most frequently selected. The results are sorted with the most frequently selected topics at the top.

Topics	Method and frequency (n) of inclusion				
	I Define the Topic	I provide a reading	I provide how-to guidance	I conduct a demonstration	I use active learning
Boolean logic (n=56)	33	14	41	49	32
Executing a database search (n=55)	23	17	39	49	31
Controlled vocabulary eg. MeSH, Emtree (n=55)	32	17	42	49	30
Synonym generation (n=55)	27	16	40	43	33
Database selection (n=55)	29	24	35	31	19
Translating search strategies (n=54)	31	25	27	30	16
Database syntax (n=53)	29	20	35	41	27
Search documentation (n=53)	35	36	34	23	12
Question formulas eg. PICOTT, PCC, SPIDER (n=52)	25	22	23	31	24
Refining review question (n=52)	30	19	24	26	21
Determining appropriate review type (n=52)	25	35	20	12	8
Reporting guidelines eg. PRISMA (n=52)	24	38	23	10	6
Conduct/methodological guidance eg. Cochrane MECIR standards, JBI Manual (n=52)	23	42	17	9	4
Testing search terms (n=51)	26	13	34	39	24
Search filters (n=51)	36	28	23	30	11
Citation management software eg. Endnote, RefWorks (n=51)	31	35	25	22	15
Deduplication (n=51)	37	24	19	19	9
Grey literature (n=51)	37	34	16	16	5
Clinical trial registries (n=49)	36	31	14	12	5

Screening (n=47)	32	27	18	13	7
Sensitivity vs. precision (n=46)	28	13	17	22	10
Protocol creation (n=45)	29	36	16	8	4
Evidence-based medicine (n=45)	32	20	12	7	5
Systematic review management software eg. DistillerSR, Covidence (n=44)	29	31	15	16	4

Pedagogy (Questions 15, 16, 17, 19)

A variety of questions were asked related to education pedagogy and teaching approaches. Respondents were asked which educational frameworks they use when developing or refining teaching. Nine options were provided in addition to an "other" text response, with respondents selecting all that applied. 61% (n= 34) of the 55 respondents answered that they do not use any specific resources or frameworks. For those that do use a pedagogical model, the ACRL Framework for Information Literacy for Higher Education was the most frequent selection (27%, n =15). Textual responses in the "other" category included additional frameworks, specifically the SCONUL framework, adult learning theory, SOLO taxonomy, and Kolb's learning cycle.

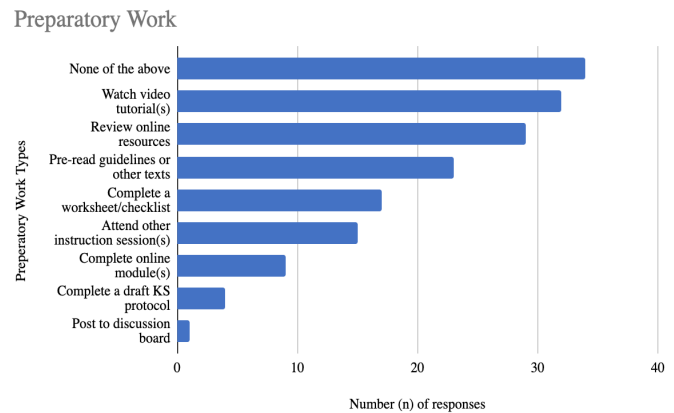
Respondents were also asked what preparatory work they typically assign to learners to complete in advance of the instructional encounter. Nine options were provided in addition to an "other" response. The majority of the 56 respondents (61%, n = 34) did not use any of the preparatory work options that were listed. The open text "other" response indicated that preparatory work was sometimes provided as an optional, but not mandatory activity. Asking students to come prepared with their own developed research question was also mentioned. Additional results are reported in Figure 3.

Respondents were asked whether they state learning objectives or learning outcomes, either provided orally or presented visually on slides. Most do, with 66% (n = 37) of the 56 respondents selecting always, 23% (n =13) responding sometimes, 7% (n = 4) responding rarely, and 3% (n =2) responding never.

For what types of support librarians provide to learners following the educational encounter, six options were provided to respondents to select from, as well as an "other" textual response option. Two follow-up supports were selected the most frequently by the 57 respondents: one-on-one consultations (89%, n= 51) and online resources such as library research guides or websites (89%, n = 51). All the other support options were also frequently selected, specifically contact information (87%, n = 50),

lecture slides (84%, n = 48), and video tutorials (61%, n = 35). All the respondents selected at least one of the additional support options provided.

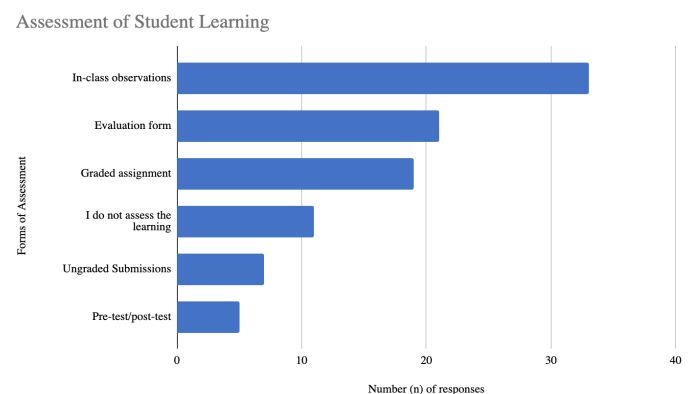
Figure 3 Quantitative responses to the question: When teaching comprehensive searching methods for KS in group settings, what, if any, preparatory work do you typically assign for learners to complete prior to the instructional encounter? Select all that apply.



Assessment (Question 18, 20)

Respondents were asked how they assess student learning. Six options were provided in addition to an "other" write-in option and they were asked to select all that apply. The most common response, with 60% (n = 33) of the 55 respondents, was in-class observations (such as class participation and informal feedback). Evaluation forms such as a ticket out the door or exit survey were the second most common form of assessment with 38% (n=21) of the 55 respondents selecting this option. Additional results are reported in Figure 4.

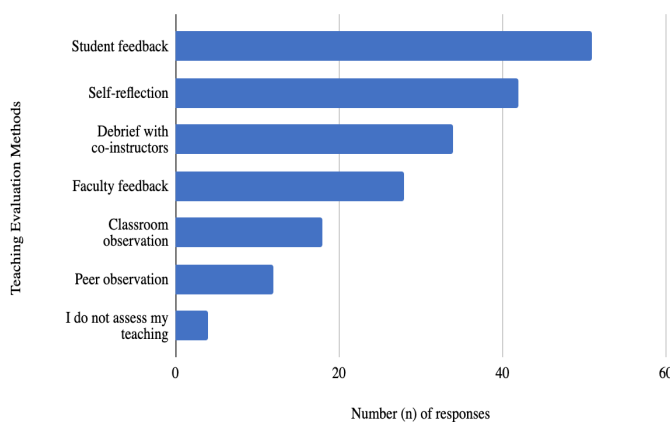
Figure 4 Quantitative responses to the question: When teaching comprehensive searching methods for KS in group settings, how do you assess student learning? Select all that apply.



Respondents were also asked how they assess their own effectiveness as teachers. Seven options were provided in addition to an “other” option, with the prompt to select all that applied. Most respondents 92% (n = 53/57) indicated that they assess their teaching in some way, most frequently using student feedback (89%, n = 51) and self-reflection (73%, n = 42) as methods to do so. Additional results are reported in Figure 5.

Figure 5 Quantitative responses to the question: How do you assess your teaching of comprehensive searching methods for KS in group settings? Select all that apply.

Assessment of Teaching



DISCUSSION

The findings from this study add to our understanding of the teaching practices, content covered in instructional sessions, and resources used when academic health librarians teach groups of students to comprehensively search for KS projects. We have learned from survey respondents that some factors can act as either motivations or barriers, such as available time, the individual’s job description, and demand from learners or instructors. The responses have highlighted trends in the content, teaching approaches, and contexts of the instruction provided by librarians.

By using a cross-sectional approach to inventory instructional practices across institutions and countries, we have added to what is known about common practices and revealed trends in KS searching instruction. Similar to other recent explorations of research support and instruction in health sciences libraries, our findings reflect current practices, including online instruction and multiple, concurrent strategies for supporting learners [32]. Other than the collation of separate descriptions in the scoping review published by Premji et al., this study is the first to look cross-institutionally at the teaching practices of librarians involved in KS instruction [13]. Furthermore, since the selection criteria of the review

excluded both single-topic (such as searching) and online instruction, our study captures a broader range of instruction reflective of librarian teaching practices [13].

Aligning with other program descriptions [15-19] and Premji et al.’s review [13], librarians in this study reported focusing on search-related skills, such as identification of appropriate databases, text and index terms, and constructing the search syntax; however, other elements of KS methods were also frequently included. Whereas the librarian-led studies included in the review covered mainly the search and question defining steps [13, 15, 16], our study found librarians report including important non-search aspects of KS projects, such as the overall methods, reporting guidance, developing a protocol, and selecting an appropriate review methodology. However, compared with searching skills, these other concepts were more often referenced by providing a reading or definition rather than by demonstration or active learning strategies.

Notably, our results suggest that librarian’s application of formal pedagogical approaches while teaching KS methodologies may be under-utilized. A minority of respondents in this study reported integrating well-known educational frameworks in the design of their instruction. Similarly, few respondents used standardized assessment of learner outcomes, assignment of pre-work, or active learning. These findings should be interpreted in the context of the limited time and pedagogical strategies common in the one-shot style of instruction that predominated the survey responses. Recent reviews of teaching in academic libraries have identified similar gaps regarding the integration of instructional design principles and models, suggesting this shortcoming is not limited to teaching comprehensive searching or KS methods [33, 34]. Librarians providing KS methods and comprehensive searching instruction to groups should increase their use of instructional design principles noted in this research and modelled in published reports of search instruction [15-19, 30]. For example, one recent case presentation of a credit course developed by librarians used self-determination theory to frame their assessment and delivery [16] and another report highlighted scaffolding as a key element of their workshop series design [31]. Integration of instructional frameworks in workshops and one-shot sessions can guide decisions regarding the design and delivery of the instruction and increase confidence in the effectiveness of the teaching and impact on learner outcomes.

The findings of this survey illustrate that some types of instruction, such as the series of open registration or drop-in workshops reported by Hayden et al. [31], Fuller et al. [17], and Lenton and Fuller [16], and for-credit, full course offerings [18] may be less common than the single session seminars or webinars reported by other librarians [19, 35]. Furthermore, while these program descriptions emphasize active learning and scaffolded exercises, our findings suggest that much of the teaching on advanced searching

techniques and KS methods relies on more passive means of delivering content, such as lectures and demonstrations. These two observations are likely linked, along with the prevalence of online instruction reported in our study, in that librarians may feel they have limited time in one-shot instruction and similarly have constraints on the teaching approaches to engage learners in online settings [36].

Of the seventeen studies summarized by Premji and colleagues, all educational interventions reported teaching searching and 14 of those included hands-on activities or experiential learning [13]. Likewise, the searching components reported in our study were the topics most likely to be taught through activities and exercises as well as other modes of delivery, suggesting librarians prioritized their engagement efforts around searching competencies. However, even the concepts and skills related to the search were not always taught through learner-centered pedagogies, including important elements such as documenting the search. Instructional program descriptions highlighting active learning techniques for comprehensive searching may not be reflected in everyday teaching practices, particularly for stand-alone workshops or one-shot sessions [17-19, 31].

Although a recent scoping review shows that very few studies of educational interventions have reported the impact of group or individual instruction on literature searching skills [14], over a third of the librarians in this sample used at least some type of student evaluation form and only 20% do not assess learner outcomes in any way. Nonetheless, informal and subjective observation of student activities and behaviors in class were the most reported means of assessing learner response, followed by students' self-reported satisfaction; such approaches provide less reliable evidence of impact compared to objectively measured changes in behaviours or knowledge. While limited student assessment options are understandable given the constrained amount of time to engage and the nature of the guest lecture or one-shot session, the usefulness of such methods is further compromised when teaching online, where student engagement can be harder to elicit and observe. This study was not designed to evaluate the effectiveness of teaching practices, but we noted that the reliance on informal observations for learner assessment limits the ability of librarian teachers to determine the impact of their instructional sessions.

This study adds considerable detail to what we know about the content and approaches in group instruction sessions on KS methods taught by librarians. Reported instruction emphasized search skills, predominantly using demonstration, lecture, and - to a lesser degree - active learning, aligning with the findings of other research related to health librarian instruction for information literacy and evidence-based practice [21,22]. However, five of the 18 topics covered by at least 90% of respondents pertained to other aspects of the review process (i.e.,

refining the review question, frameworks for question formulation, determining appropriate review methodology, and reporting and conduct guidance), reflecting an appreciation of the interconnected steps when conducting KS research. Similarly, while librarian-led demonstrations and lectures were the most frequent forms of teaching, our results demonstrate that referring learners to self-directed learning tools, such as library research guides and video tutorials were also common strategies. The use of these resources as pre-work echoes the flipped classroom approaches to teach these topics, as reported by others [17,19]. Likewise, engaging active learning approaches such as the use of worksheets, polls, and collaborative group work were reported to be employed at least sometimes by most respondents, correlating with other reported KS methods instruction approaches from the studies included in the review by Premji et al. [13].

Limitations

While this study includes responses from multiple librarians at numerous institutions, it is only representative of those librarians who completed the survey. The length of the questionnaire may have deterred some potential respondents, as at least one person noted survey fatigue by the end of the form. There was also a decline in the response rate as the survey continued. Therefore, our findings may only be representative of some contexts and perspectives and may not be generalizable.

We recognize we sacrificed richness of data for breadth of reach as this type of survey also relies on self-report and individual recall, rather than observation or in-depth description of specific teaching experiences. Furthermore, in addressing our research questions related to group instruction practices, we explicitly excluded one-to-one research consultations. Knowledge synthesis instruction through individual consultations has been acknowledged as a significant means of supporting students and other researchers. This was noted both by the respondents of this survey, as well as in the authors' experiences, and aligns with what has been noted in the literature [20].

Similarly, this study does not examine the impact of advanced searching instruction on learner outcomes or outputs, an area of interest that currently lacks evidence, as noted in the recent scoping review of literature search instruction [14]. It is also possible that some survey responses were affected by the recent pandemic, as respondents to our survey noted the same increase in online instruction that was reported across health library teaching, but this relationship was not explored in our data [32].

Future Research

The findings of this survey suggest possible directions for further research regarding the tools, approaches, and content employed by health librarians when providing support to individual learners, either through a similar survey or by ethnographic observations of librarians during research consultations. There are no existing measures of KS competencies for health professional trainees, though there has been work done to determine the competencies needed by librarians who support these projects [37] and descriptions and evaluations of the training for librarians related to SRs [38–40]. Likewise, some research has been done to develop measures of search expertise [41–44], but these measures have not been applied in the population of health professions trainees in the context of conducting KS projects. For example, unlike evidence-based practice competencies that focus on individual abilities [45], KS methods guidance emphasizes research teams with collective expertise, so developing advanced searching skills is less important than building an understanding of what thorough and systematic search strategies entail. The results from this survey will also allow for later exploration on the effectiveness of specific training interventions regarding the search skills, research outputs, or other research competencies of students working on KS projects. Understanding the effectiveness and role of librarian-led training will allow a better demonstration of the value health sciences librarians are bringing not only to the KS research landscape, but to the educational experiences of health science students as well.

Conclusions and Implications for Practice

The educational support provided by librarians is important for students who are encouraged to conduct comprehensive reviews so they may become competent researchers and critical and thoughtful consumers of reviews. These findings may inspire librarians to expand their instruction beyond single sessions for individual courses or programs, to devote more time to active learning, and incorporate more structured approaches to designing sessions, assessing learner outcomes, and evaluating impact. Prioritizing time and effort with learners to build the technical skills and conceptual knowledge related to comprehensive search strategy development specifically utilizes librarian expertise. Meanwhile, instruction that links content related to other steps of review methods and research processes generally helps scaffold and contextualize learning about KS methods. Collaborating with supervisors, faculty, and other synthesis methodologists can help librarians coordinate instruction for groups of health sciences learners to align objectives, assess learner needs, and extend their impact on student success in the context of KS research. In combination with published program descriptions, our research provides librarians with examples of teaching strategies and content from which to

select when designing or expanding instruction related to comprehensive searching and KS methods.

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DATA AVAILABILITY STATEMENT

Data associated with this article are available in the Open Science Framework at <https://osf.io/7h3pt/>.

AUTHOR CONTRIBUTIONS

Glyneva Bradley-Ridout: data curation; formal analysis; investigation; project administration; supervision; writing - original draft; writing - review & editing. Robin Parker: conceptualization; data curation; formal analysis; investigation; methodology; writing - original draft; writing - review & editing. Lindsey Sikora: conceptualization; investigation; methodology; writing - original draft; writing - review & editing. Andrea Quaiattini: formal analysis; investigation; writing - original draft; writing - review & editing. kaitlin fuller: data curation; investigation; writing - original draft; writing - review & editing. Maggie Nevison: data curation; formal analysis; writing - original draft; writing - review & editing. Erica Nekolaichuk: conceptualization; data curation; investigation; project administration; supervision.

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SUPPLEMENTAL FILES

- **Appendix A:** Complete Survey
- **Appendix B:** Positionality Statement
- **Appendix C:** Recruitment Email
- **Appendix D:** Methodology Schematic
- **Appendix E:** Table Illustrating Frequency of Codes
- **Appendix F:** Responses for “Other” Tools Used
- **Appendix G:** Table Illustrating the Frequency of Respondents Who Cover Different Topics, Sorted in Order of Most Frequent to Least

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Evaluating the discoverability of supporting research materials in ClinicalTrials.gov for US federally funded COVID-19 clinical studies

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Objective: The objective of this study was to evaluate the discoverability of supporting research materials, including supporting documents, individual participant data (IPD), and associated publications, in US federally funded COVID-19 clinical study records in ClinicalTrials.gov (CTG).

Methods: Study registration records were evaluated for (1) links to supporting documents, including protocols, informed consent forms, and statistical analysis plans; (2) information on how unaffiliated researchers may access IPD and, when applicable, the linking of the IPD record back to the CTG record; and (3) links to associated publications and, when applicable, the linking of the publication record back to the CTG record.

Results: 206 CTG study records were included in the analysis. Few records shared supporting documents, with only 4% of records sharing all 3 document types. 27% of records indicated they intended to share IPD, with 45% of these providing sufficient information to request access to the IPD. Only 1 dataset record was located, which linked back to its corresponding CTG record. The majority of CTG records did not have links to publications (61%), and only 21% linked out to at least 1 results publication. All publication records linked back to their corresponding CTG records.

Conclusion: With only 4% of records sharing all supporting document types, 12% sufficient information to access IPD, and 21% results publications, improvements can be made to the discoverability of research materials in federally funded, COVID-19 CTG records. Sharing these materials on CTG can increase their discoverability, therefore increasing the validity, transparency, and reusability of clinical research.

Keywords: Clinical studies; COVID-19; Data sharing; clinicaltrials.gov; research transparency; discoverability



See end of article for supplemental content.

INTRODUCTION

The COVID-19 pandemic has transformed the clinical research landscape, with one such effect being the rapid generation of COVID-19 clinical studies [1-3]. As of May 19, 2023, the classic version of ClinicalTrials.gov (CTG), a clinical study registry maintained by the US National Library of Medicine (NLM), retrieved well over 9,000 results with its COVID-19 filter [4]. While this rapid influx in clinical studies has generated groundbreaking discoveries relating to the prevention and treatment of COVID-19, it has also raised concerns relating to the quality of these studies and, consequently, the reliability of their findings [2, 5-7].

Sharing the research materials associated with a study, including full datasets, publications, and supporting documents (i.e., protocols, informed consent forms, and

statistical analysis plans), increases the validity, transparency, reproducibility, and overall utility of study results, and can help to foster public trust in clinical research findings [2, 8-15]. Many organizations, such as the National Institutes of Health (NIH), the Food and Drug Administration (FDA), and the International Committee of Medical Journal Editors (ICMJE), require and/or encourage the sharing of datasets, publications, and supporting documents deriving from clinical studies [12, 16-18], with many additional organizations calling for the release of these materials during the COVID-19 pandemic [19-21]. The release of the Office of Science and Technology Policy's 2022 memorandum, "Ensuring free, immediate, and equitable access to federally funded research" (aka the Nelson Memo), additionally calls for the public availability of research materials deriving from all federally funded research [22].

While these policies are certainly helpful in encouraging the sharing of clinical research materials, the utility of these materials is limited if they are not discoverable for unaffiliated researchers (i.e., researchers not affiliated with the clinical studies). CTG is a publicly accessible clinical study registry that facilitates the discovery of clinical studies and their associated materials [23]. CTG includes both interventional and observational studies and includes sections in each study record that allow for the sharing of (among other things) supporting documents; individual participant data (IPD) sharing plans; and publications associated with the clinical study [24]. Due to its comprehensiveness and accessibility as a clinical study information discovery tool, CTG has been utilized by multiple studies in determining the extent to which clinical studies share their research materials; however, few studies have evaluated this within the context of COVID-19, with the exceptions of Rodgers et al., which examined availability of summative results and results publications [5]; Li et al. and Larson et al., which both examined IPD sharing plans [8, 9]; and Huser & Mayer, which examined availability and cross-linking of results publications to CTG records [25]. Even fewer, if any, studies have cumulatively examined the availability of supporting documents, associated publications, and information relating to IPD access in COVID-19 CTG records, nor done a granular analysis into how this information is linked in and, in the cases of publications and IPD, cross-linked back to the CTG records. Such information can give greater insight into the current sharing practices of these materials on CTG and highlight the discoverability (or lack thereof) of these materials.

The objective of this study was to examine US federally funded COVID-19 clinical study records in CTG, specifically studies that contained at least 200 participants, to evaluate (1) links to supporting documents; (2) information on how unaffiliated researchers may access IPD and, when applicable, the linking of the IPD record back to the CTG record; and (3) links to associated publications and, when applicable, the linking of the publication record back to the CTG record. The data from this research will provide insight into the sharing practices and discoverability of supporting research materials from US federally funded COVID-19 clinical studies; contribute to discussions relating to the transparency of clinical study research; and inform librarians and the clinical investigators they serve as they prepare to meet federal sharing policies to make their research materials discoverable, accessible, and more transparent.

METHODS

The authors decided to focus on federally funded studies due to the many policies that encourage sharing of federally funded research materials [12, 17, 18], and limited studies to those containing at least 200 participants

for the sake of a convenience sample manageable for the time constraints of the project.

To facilitate understanding of commonly used terms in this paper the authors have provided a glossary in Appendix A. The authors have also provided Appendix B, which lists each of the data items collected for this study and screenshots of where the data items were collected from each record.

To isolate federally funded COVID-19 studies in ClinicalTrials.gov (CTG), a combination of the COVID-19 filter (i.e., the link to "See listed clinical studies related to coronavirus disease (COVID-19)") and the Funder Type filters for "NIH" and "Other US Federal Agency" (on the results page of CTG) were used in the classic version of CTG, resulting in a total of 326 CTG records. Results were exported as a CSV on June 6, 2022, and saved as an Excel file.

Excel was used to filter out studies containing fewer than 200 participants, being determined by the number in the "Enrollment" column. This resulted in a total sample of 206 CTG records.

Collecting Data on Sharing of Supporting Documents

CTG has a section (called Study Documents) that allows investigators to share protocols, informed consent forms, and statistical analysis plans [24]. Using the information from this section, data were collected on whether CTG records provided links to these supporting documents.

Collecting Data on Sharing of IPD

CTG provides a section (called Individual Participant Data (IPD) Sharing Statement, hereafter called IPD Sharing Statement) in which investigators may divulge their plans for sharing IPD with other researchers [24]. Within the IPD Sharing Statement, we examined the following subsections: Plan to Share IPD, Plan Description, Access Criteria, and Time Frame. Data were collected from each of these subsections for records' intentions to share and, when applicable, how they shared or intended to share IPD. More specifically, data were collected on:

1. Whether the investigators stated they planned to share their data in the Plan to Share IPD subsection.
2. Whether the investigators stated they plan to share their data with unaffiliated researchers in either the Plan Description or the Access Criteria subsections. Note that plans that specified they only intended to share summary data or genetic sequencing data were categorized as a "no." Statements that IPD would only be shared within the investigating team/affiliated institution(s) were also categorized as a "no."

3. Whether there were any inconsistencies between the Plan to Share IPD and Plan Description/ Access Criteria subsections.
4. What the timeline (if any) was for sharing data listed in the Time Frame subsection. This included both stipulation and timeframe information. In the context of this study, "stipulation" refers to any conditions where a specific activity must be completed before datasets are made available (e.g., after publication). "Timeframe" refers to any specific time or date range for sharing the datasets (e.g., within three months).
5. What the mechanism was for unaffiliated researchers getting access to the IPD listed in either the Plan Description or the Access Criteria subsections.
6. In cases where investigator contact was listed as the mechanism for getting access to IPD, whether an email address was provided anywhere in the CTG record.
7. In cases where a data sharing platform was listed as the mechanism for getting access to IPD, whether the name of the data sharing platform in which the investigators plan to share their IPD was listed in either the Plan Description or the Access Criteria subsections.
8. In cases where a data-sharing platform was listed as the mechanism for getting access to IPD, and where the platform was named, the discoverability of the study's associated dataset record in the platform. Note that for studies that named a specific data-sharing platform but didn't provide a direct link to the dataset record, the platform was searched using the study's NCT number (i.e., unique identifiers assigned to clinical studies registered in CTG [26]) or, if the latter retrieved no results, using the study's title from its corresponding CTG record.
9. For CTG records where an associated dataset record was found in a data sharing platform, whether there was a link from the dataset record back to the CTG record.

Notes that informed data entry (including quotations from the Plan Description and Access Criteria subsections) were also included. Any questionable items (i.e., where the primary investigator (PI) was uncertain of data points due to ambiguous language in the study record) were referred to the PI's coauthor and resolved via consensus.

Collecting Data on Sharing of Publications

Publications can be linked in CTG records in two different ways:

1. **Manual links:** In the More Information section of CTG records, study investigators can manually provide links to publication records in PubMed (for the purpose of this study, "publication record" will hereafter refer to publication records in PubMed) [23]. Investigators have the option of labelling these manual links as either results or reference publications, with results publications referring to publications that report on the results of the study, and reference publications referring to works the study is citing.
2. **Automatic links:** Automatic links to publication records are automatically added to the More Information section of the CTG record. These links are generated if the NCT number of the study was included in the publication record [27-30]. Unlike manual links, automatic links do not have labels to distinguish between results or reference publications.

Publication records can link *back* to CTG records in three different ways:

3. **Associated Data links:** Associated Data links, which go directly to the CTG record, are added by publishers and/or staff at the National Library of Medicine to the publication record [31].
4. **Abstract links:** Abstract links are links to the CTG record that are within the text of the publication record's abstract. These links go directly to the CTG record.
5. **LinkOut links:** LinkOut links are automatically assigned to publication records whenever a link to the publication record is added to a CTG record within CTG. LinkOut links are indirect, meaning that when a user clicks one, the user will be taken to a search of the publication record's PubMed ID (PMID) in CTG [29].

With this information in mind, data were collected on the following:

1. The link to the publication record listed in the CTG record (i.e., the link from the record was copy-pasted into the Excel sheet).
2. Whether the linked publication record was an automatic link.
3. For publication record links added manually to the CTG record, their categorization (i.e., as a "results_reference" or "reference") when using the XML view in the CTG record. Note that the XML view is accessible by adding "?resultsxml=true" to the end of the CTG record link [25, 29, 30].

4. Whether the publication record could be retrieved when searching the NCT number with the [si] field tag in PubMed. Note that the [si], or Secondary Source ID, field contains information relating to a variety of data, including any available NCT numbers associated with a publication [29, 32]. NCT numbers are automatically added to the [si] field when PubMed's algorithm finds NCT numbers in the abstract of a publication record [25].
5. Whether the publication record could be retrieved when searching the NCT number with the [tw] field tag in PubMed. Note that, according to the PubMed User Guide, the [tw], or Text Words, field includes "all words and numbers in the title, abstract, other abstract, MeSH terms, MeSH subheadings, publication types, substance names, personal name as subject, corporate author, secondary source, comment/correction notes, and other terms in the PubMed record" [33].
6. The PMID of the publication record.
7. Whether the publication record had an Associated Data link back to the CTG record.
8. Whether the publication record had a LinkOut link back to the CTG record.
9. Whether the publication record had an abstract link back to the CTG record.

Publications were also evaluated for whether they could be categorized as full results publications for their associated CTG record (i.e., full, original research publications reporting on the results of the study, and that study alone). To do this, a decision tree was created (to access the decision tree, see Appendix C). Any questionable items were referred to the PI's coauthor and were resolved via consensus.

RESULTS

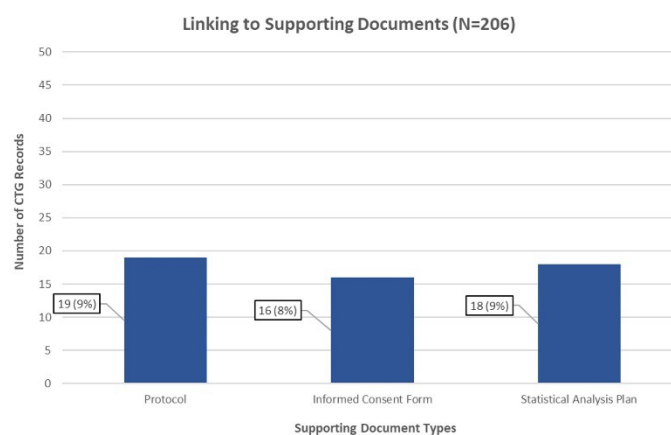
Records were exported from CTG on June 6, 2022. 206 CTG records were included in the analysis. See Appendix D: Table 1 and Figure 1 for information on the CTG records' characteristics.

Sharing of Supporting Documents

Of the 206 CTG records, 19 (9%) provided links to protocols, 16 (8%) to informed consent forms, and 18 (9%) to statistical analysis plans (see Figure 1). Only 8 (4%) CTG records contained links to all 3 supporting document types.

All supporting document links were functional and allowed users to access documents as downloadable PDFs.

Figure 1 Number of CTG records that linked to protocols, informed consent forms, or statistical analysis plans



Sharing of IPD

Of the 206 CTG records, 53 (26%) stated "Yes" (12 or 29% of the 42 records marked as completed) in their Plan to Share IPD subsection for their intentions to share IPD. 69 (33%) did not have a Plan to Share IPD Statement (15 or 36% for completed) (see A in Table 1). In their Plan Description/ Access Criteria subsections, 48 (23%) of the 206 records indicated "Yes" (12 or 29% of the 42 completed records) for their intention to share IPD. 131 (64%) of the 206 records (28 or 67% of the 42 completed) did not have a Plan Description nor Access Criteria subsection (see B in Table 2). Inconsistencies were identified in 10 (5%) of the 206 CTG records when comparing their Plan to Share IPD subsection with their Plan Description/ Access Criteria subsections for their intentions to share IPD. No completed records had inconsistencies (see C in Table 1).

Of the 55 records that stated they intended to share IPD in either their Plan to Share IPD or their Plan Description/ Access Criteria subsections (this number including records that had inconsistencies with at least one response being "Yes"), 32 (58%) (16% of all 206 records) indicated a mechanism for how they would share IPD, being either upon request or via a data sharing platform. When limiting to the 12 records with a completed status that stated they intended to share IPD, 10 (83%) (24% of all 42 completed records) indicated a mechanism for how they would share IPD (see D in Table 1).

Of the 14 records that intended to share IPD upon request (i.e., via email), 9 (64%) (4% of all 206 records) provided an email address for at least 1 investigator somewhere in the CTG record. When limiting to the 2 completed records that intended to share IPD upon request, 1 (2% of all 42 completed records) provided an email address (see E in Table 1).

Table 1 Intentions to share and provision of information to access IPD in the CTG records.

A. Intentions to share IPD in Plan to Share IPD				
Response	All Records (N=206)	Completed Records (N=42)		
Yes	53 (26%)	12 (29%)		
No	62 (30%)	14 (33%)		
Undecided	22 (11%)	1 (2%)		
Irrelevant*	69 (33%)	15 (36%)		
B. Intentions to share IPD in Plan Description/Access Criteria				
Response	All Records (N=206)	Completed Records (N=42)		
Yes	48 (23%)	12 (29%)		
No	17 (8%)	1 (2%)		
Undecided	10 (5%)	1 (2%)		
Irrelevant*	131 (64%)	28 (67%)		
C. Inconsistencies between A and B†				
Response	All Records (N=206)	Subset of All Records (N=10)	Completed Records (N=42)	Subset of Completed Records (N/A)
Yes, No	7 (3%)	7 (70%)	0 (0%)	N/A
No, Yes	1 (0.5%)	1 (10%)	0 (0%)	N/A
No, Undecided	1 (0.5%)	1 (10%)	0 (0%)	N/A
Undecided, Yes	1 (0.5%)	1 (10%)	0 (0%)	N/A
D. Mechanisms for accessing IPD in Plan Description/Access Criteria§				
Response	All Records (N=206)	Subset of All Records (N=55)	Completed records (N=42)	Subset of Completed Records (N=12)
Upon request (i.e., via email)	14 (7%)	14 (25%)	2 (5%)	2 (17%)
Data sharing platform	18 (9%)	18 (33%)	8 (19%)	8 (67%)
Unspecified†	23 (11%)	23 (42%)	2 (5%)	2 (17%)
E. Access information for contacting investigators anywhere in CTG record (only for records stating they planned to share IPD upon request, i.e., via email)§				
Response	All records (N=206)	Subset of All Records (N=14)	Completed records (N=42)	Subset of Completed Records (N=2)
Email address provided of at least 1 investigator	9 (4%)	9 (64%)	1 (2%)	1 (50%)

Email address not provided	5 (2%)	5 (36%)	1 (2%)	1 (50%)
F. Access information for data sharing platforms in Plan Description/Access Criteria (only for records stating they planned to share IPD via a data sharing platform)§				
Response	All records (N=206)	Subset of All Records (N=18)	Completed records (N=42)	Subset of Completed records (N=8)
Platform named	16 (8%)	16 (89%)	6 (14%)	6 (75%)
Platform not named	2 (1%)	2 (11%)	2 (5%)	2 (25%)

* In (A), "Irrelevant" indicates that there was no IPD Sharing Statement section, (and therefore no Plan to Share IPD subsection). For (B), it indicates there was no Plan Description nor Access Criteria subsections in the record.

† In (C), the responses are organized by the Plan to Share IPD followed by the Plan Description/Access Criteria responses. For example, "Yes, No" indicates the records stated "Yes" in their Plan to Share IPD subsection, but "No" in their Plan Description/Access Criteria subsections.

§ (C), (D), (E), and (F) include the total number of records followed by a specific subset. For (C) the subset (10, or 0 for completed) is the number of CTG records that had inconsistencies between (A) and (B). For (D) the subset (55, or 12 for completed) is the number of records that stated "Yes" in either (A) or (B). For (E) the subset (14, or 2 for completed) is the number of records that listed "Upon request" (i.e., via email) in (D). For (F) the subset (18, or 8 for completed) is the number of records that listed "Data sharing platform" in (D).

¶ In (D), "Unspecified" indicates no mechanism for unaffiliated researchers accessing IPD was indicated in the Plan Description nor Access Criteria subsections in the record.

Table 2 Stipulations and timeframes the CTG records listed for sharing IPD.

All records that stated they intended to share IPD (N=55)				
Stipulation, with or without timeframe	Records	Range	Mean	Median
No stipulation, no timeframe	14 (25%)	N/A	N/A	N/A
After publication, with timeframe	11 (20%)	0 to 36 months	10 months	9 months
No stipulation, with timeframe	7 (13%)	0 to 9 months	3 months	0 months
After study completion, with timeframe	6 (11%)	6 to 84 months	22 months	11 months
After study completion, no timeframe	5 (9%)	N/A	N/A	N/A
No stipulation, year named	5 (9%)	2021 to 2026	2023	2023

After publication, no timeframe	3 (5%)	N/A	N/A	N/A
After database lock, with timeframe	3 (5%)	24 months	24 months	24 months
After "first survey collected," with timeframe	1 (2%)	6 months	6 months	6 months
Completed records that stated they intended to share IPD (N=12)				
Stipulation, with or without timeframe	Records	Timeframe	Mean	Median
No stipulation, no timeframe	3 (25%)	N/A	N/A	N/A
After publication, with timeframe	4 (33%)	0 to 12 months	7.5 months	9 months
No stipulation, with timeframe	0 (0%)	N/A	N/A	N/A
After study completion, with timeframe	2 (17%)	6 to 84 months	45 months	45 months
After study completion, no timeframe	1 (8%)	N/A	N/A	N/A
No stipulation, year named	1 (8%)	2021	2021	2021
After publication, no timeframe	0 (0%)	N/A	N/A	N/A
After database lock, with timeframe	1 (8%)	24 months	24 months	24 months
After "first survey collected," with timeframe	0 (0%)	N/A	N/A	N/A

Table 3 Number and proportion of CTG records that had links to publication records, and summative statistics on number of links in the CTG records.

Records with X number of links	All records (N=206 records)	Completed records (N=42 records)
Records with 0 links (any type)	126 (61%)	16 (38%)
Records with only 1 link (any type)	36 (17%)	13 (31%)
Records with > 1 < 10 links (any type)	35 (17%)	11 (26%)
Records with ≥ 10 links (any type)	9 (4%)	2 (5%)
Records that <i>only</i> linked to non-results publications	37 (18%)	8 (19%)
Records that linked to at least 1 results publication	43 (21%)	18 (43%)

Summative statistics for number of links in CTG records	Links in all records (N=479 links)	Links in completed records (N=114 links)
Mean number of links	2.33 (SD=7.77)	2.71 (SD=7.87)
Median number of links	0	1
Maximum number of links	52	50
Minimum number of links	0	0
Summative statistics for number of results links in CTG records	Results links in all records (N=66 links)	Results links in completed records (N=20 links)
Mean number of links	0.32 (SD=0.87)	0.48 (SD=0.63)
Median number of links	0	0
Maximum number of links	6	3
Minimum number of links	0	0

Of the 18 records that stated they intended to share via a data sharing platform, 16 (89%) (8% of all 206 records) named a specific data sharing platform. When limiting to the 8 completed records that stated they intended to share via a data sharing platform, 6 (75%) (14% of all 42 completed records) named a specific data sharing platform (see F in Table 1). None of the records, regardless of status, linked to a dataset record in a data sharing platform; only 1 dataset record (being from a CTG record with a completed status) was found by searching the named data sharing platform, which did link back to its corresponding CTG record.

Cumulatively, 25 (45% of the 55 CTG records that stated they intended to share IPD or 12% of all 206 CTG records) provided sufficient information to access IPD (i.e., they provided either an email address for records that stated they would share IPD via email, or named a data sharing platform for those that stated they would share IPD via a data sharing platform). When limiting to records with a completed status, 7 records (58% of those that stated they intended to share IPD, or 17% of all 42 completed records) provided sufficient information to request access to IPD (see E and F in Table 1. For a breakdown of this data by record start year, see Appendix D: Figures 2 and 3).

Stipulations and timeframes for sharing IPD were variable. Of the 55 records stating they intended to share IPD, 22 (40%) did not share a specific timeframe for sharing their IPD. When limiting to the 12 records with a completed status that stated they would share IPD, the number was 4 or 33%. The most common stipulation was that IPD would be shared after the investigators published

their findings in a journal with a specified timeframe (11 or 20% of the 55 CTG records, 4 or 33% of the 12 completed records), with the specified timeframe after publication being anywhere between immediate and 36 months (or immediate to 12 months for the completed records) (see Table 2).

Sharing of Publications

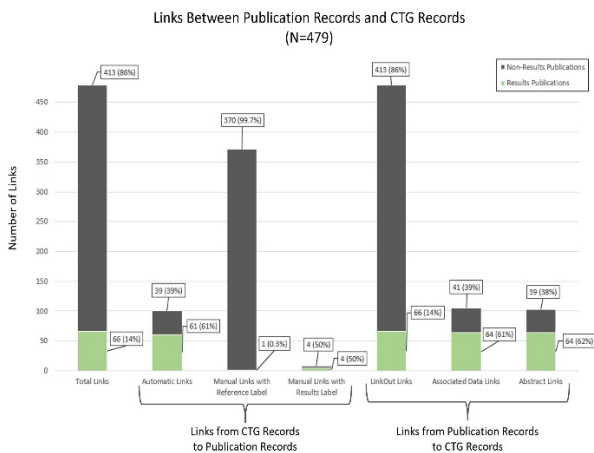
Of the 206 CTG records, 80 (39%) provided one or more links to publication records. Of the 42 completed records, 26 (62%) provided one or more links to publication records. 43 (21%) of the 206 CTG records, including 18 or 43% of completed records, linked to at least 1 results publication (see Table 3. For a breakdown of these data by record start year, see Appendix D: Figures 4 and 5).

There were 479 total links to publication records in the sample of 206 CTG records, with 66 (14%) of these being links to results publication records (see Figure 2).

For links from the CTG records to the publication records, 100 were automatic links, with 61 being links to results publication records. 371 were manual links and were assigned a "Reference" label, with just 1 of these linking to a results publication record. 8 manual links were assigned a "Results" label, with half of these linking to a results publication record (see Figure 2).

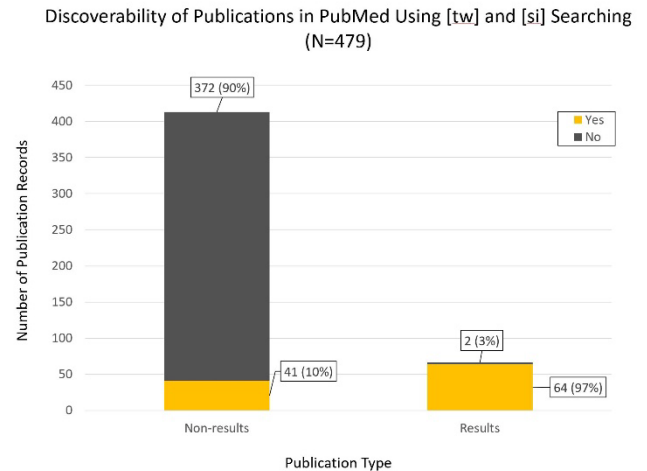
For links from publication records back to their corresponding CTG records, all 479 publication records linked back to their CTG records using a LinkOut link. 105 publication records linked back to their CTG record using an Associated Data Link, with 64 (61%) of these being results publication records. 103 publication records linked to their CTG records using an Abstract Link, with 64 (62%) of these being results publication records (see Figure 2).

Figure 2 Number and types of links between publication records (including non-results and results publication records) and their corresponding CTG records.



Sixty-four (97%) of the 66 linked results publication records could be found in PubMed by searching NCT number using the [si] or [tw] field tags. Retrieval of linked non-results publications was significantly less, with 41 (10%) of the 413 records being retrieved (see Figure 3).

Figure 3 Number of non-results and results publications retrieved/not retrieved by searching the NCT number using [tw] and [si] field tags in PubMed.



DISCUSSION

Sharing of Supporting Documents

Accessibility of supporting documents increases the transparency and utility of clinical study results [6, 34]. The submission of protocols and statistical analysis plans to CTG is a requirement for all clinical trials receiving NIH funding. This requirement has been in place since 2017, with an extension to 2024 for basic experimental studies involving human participants. The submission of protocols and statistical analysis plans is additionally required by studies subject to the FDA's Final Rule for Clinical Trials Registration and Results Information Submission since 2017 [17, 18].

As indicated by this study, the sharing of supporting documents in federally funded COVID-19 CTG records is uncommon, with only 4% of CTG records in this study sharing all three supporting document types. A few studies have touched on the availability of supporting documents in clinical studies, including Gaba et al (who reported 11% for sharing protocols and 9% statistical analysis plans in a subset of non-commercially funded clinical trial CTG records), and Kapp et al (who reported a higher 38% for the sharing of protocols and 29% for statistical analysis plans for a subset of COVID-19 trial publications) [35, 6]; however, there is a dearth of studies that have examined the availability of these documents in

the CTG record, itself, especially within the context of COVID-19. More studies are needed to evaluate the availability of these documents in these CTG records, and there needs to be greater effort to encourage investigators to link these documents in CTG records. Additionally, separate attention should be paid to the format in which supporting documents are shared, as the addition of computable formats, such as HTML, could facilitate more in-depth analyses.

Sharing of IPD

Sharing IPD deriving from clinical studies increases the validity, transparency, reproducibility, and utility of study results; facilitates the ability for unaffiliated researchers to build upon past discoveries; reduces study redundancy; and assists in fulfilling the ethical obligation to study participants of maximizing the impact of study findings [2, 8-12]. Though not required, IPD sharing is strongly encouraged by the NIH and the ICMJE, with both requiring the submission of data management and sharing plans for studies funded by the NIH (as of January 25, 2023) or published by ICMJE membership journals (as of January 2019) [8, 10, 12, 15, 36].

As indicated by this study, intentions to share IPD for federally funded COVID-19 studies in CTG can be improved. The study found that only 27% of the 206 records (or 29% of 42 records with a completed status) indicated they planned to share their IPD with unaffiliated researchers. This number, while suboptimal, was slightly greater than estimates from previous studies, with Li et al. and Larson et al. both being at around 15% for subsets of CTG records for COVID-19 studies [8, 9]; and Begeris et al., Ohmann et al., and Gaba et al. being between 10% and 12% for subsets of clinical trial CTG records (not limited to COVID-19) [34, 35, 37]. These consistently low numbers, both in this study and in these past studies, are likely reflective of the reservations that investigators have towards sharing data, which include fears of privacy risks to study participants, unaffiliated researchers misusing or misinterpreting data, and lack of proper attribution [38]. However, in terms of fearing privacy risk to participants, it is important to note that clinical study participants themselves are supportive of data sharing, even when considering potential risks to themselves as a result of this sharing [11]. With regard to proper attribution, research has shown that studies that share data tend to be cited more frequently than those that don't [39, 40]. There should be more effort on the part of organizations and librarians to inform investigators of these ethical and professional benefits from sharing research data. Librarians can also provide resources on where and how to share data, including available clinical data sharing platforms for depositing data and where to find guidance on how to safely share IPD, such as that provided by the Inter-university Consortium for Political and Social Research [41].

An additional area that could be improved is the availability and standardization of IPD sharing plans in CTG. Of the 206 records, a surprising 33% (or 36% of the 42 completed records) had no IPD Sharing Statement in the CTG record, being a finding that reinforces that of Gaba et al., who found that 23% of a subset of non-commercially funded clinical trial CTG records didn't have an IPD sharing plan [35]. Additionally, a few records had discrepancies between their IPD Sharing Plan and their Plan Description/Access Criteria subsections, an observation that was similarly remarked upon by Larson et al. and Bergeris et al., who also noted instances of these discrepancies in the subsets of clinical trial CTG records they examined [9, 37]. Listed mechanisms for IPD sharing were also lacking, with only 58% of the 55 records that indicated they intended to share IPD (or 16% of all 206 records) providing information on the mechanism by which they would share IPD (as a note, this number did increase slightly when limiting to the 12 completed records that stated they intended to share IPD, with 83% of the 12 records, or 24% of all 42 completed records, providing a mechanism by which they would share IPD); though this finding was an improvement compared to Larson et al. and Gaba et al., which had been 26.6% and 6%, respectively [9, 35]. However, the number was lower when further limiting to studies that provided both a mechanism and an email address or the name of the data sharing platform, when applicable, which was only 45% of the 55 records (58% of the 12 completed records), or just 12% of all 206 CTG records (17% of all 42 completed records). Finally, stipulations and timelines for sharing IPD were frequently ambiguous and lacked standardization. The complete exclusion of IPD plans, and the discrepancies, lack of information for requesting access to IPD, and unstandardized data sharing timelines reflect the need for increased guidance, transparency, and standardization, a need particularly vital with the current NIH and ICMJE requirements for submissions of IPD sharing plans [12, 36]. Librarians can assist in this area by providing workshops and guidance for how to create and what information to include in data sharing plans, including how to make data more discoverable. CTG, as a platform, may also consider developing automated machine learning approaches to parsing the data sharing plan and related structured fields in the CTG record and providing feedback to study record administrators during the record review stage. Such a review step is already in place for some parts of the CTG record and extending it with additional review of the IPD sharing plan would require minimal process changes. This addition could assist in alerting administrators to missing or discrepant information in IPD sharing plans and increase standardization of these plans.

Sharing of Publications

Scholarly publications deriving from clinical studies support evidence-based decision making and, especially

in the context of pandemics, serve as an invaluable vehicle for disseminating knowledge to control and manage disease [13, 14]. Following the encouragement of the National Science and Technology Advisors and Wellcome Trust, among others, a number of publishers volunteered to make publications relating to COVID-19 research publicly available during the pandemic [19-21]. Additionally, the Nelson Memo calls for the public availability of publications deriving from federally funded research, among other research materials [22].

As demonstrated by this study, links from federally funded COVID-19 CTG records to publications (and vice versa) could be improved. In terms of links from CTG records to publication records, only 21% of the 206 CTG records (43% of the 42 completed records) linked out to at least 1 results publication, being slightly higher than Huser & Mayer in their study of COVID-19 clinical trials, which had been at 17.8% for all COVID-19 trials, regardless of funding source [25]. To be fair, the low number of linked results publications may be attributed to the relative recentness of the COVID-19 pandemic, the investigating teams conducting these studies not having had sufficient time to publish their results in a journal.

Of note, the vast majority (86%) of linked publication records in CTG records were not results publications. While linking to non-results publication records can give researchers related information on the clinical study, CTG records could be improved by clarifying the identity of these linked records, being a view that isn't unique to this study [27, 29]. Though this distinction can be accessed in the XML view of CTG for manually linked publications, it is not available for automatically linked publications. The absence of these labels complicates the detection of automatically linked results publications within a CTG record, as they are frequently interspersed with automatic links to non-result publications. Because so many results publications (92%) in this study were linked automatically, it would be beneficial to introduce results and non-results labelling to automatically linked publication records. One potential solution could be having CTG notify investigators when a publication has been detected by the algorithm that assigns these automatic links and require investigators to confirm whether the publication is a results publication prior to it being added to the CTG record.

The extent to which publication records linked back to CTG records was promising, with the majority (97%) of the 66 results publications linking back to their corresponding CTG record using an Associated Data link and/or abstract link. Associated Data and abstract links are arguably preferred over the LinkOut links, as the former two link directly to the CTG record rather than the results of a PMID search in CTG, as is the case with LinkOut links. Unlike LinkOut links, they also include the NCT number in the links, which can be retrieved by an [si] search (in the case of Associated Data links) or [tw] search

in PubMed. However, all the link types could benefit from better labelling, as there is currently no quick way of distinguishing results from non-result publication records in PubMed. While ICMJE requires the provision of registration numbers (e.g., NCTs) in the abstracts of clinical trial publications [42], they do not require specific language acknowledging that the publication is reporting upon the results of the trial in the abstract. This complicates the detection of results publications, as numerous non-results publications in the sample also included NCT numbers in their abstracts. One way to mediate this issue would be for librarians and other stakeholders such as ICMJE to encourage investigators to include specific statements in the abstract that the publication is reporting on the results of the study. Consistent and standardized usage of language such as this could also pave the way for future, automatic labelling of results publications in PubMed.

Promisingly, searching by NCT number using [si] and [tw] searching in PubMed was effective in retrieving results publication records linked in CTG. The efficacy of [si] and [tw] searching is not altogether surprising, as the inclusion of NCT numbers in the abstracts of results publications is required by ICMJE [42]. Better labelling, however, could be applied to the metadata of PubMed records to better identify results publications, as both [tw] and [si] searching retrieved results as well as non-results publications.

Limitations and Conclusion

There were limitations to this study. Due to time constraints, only studies containing at least 200 participants were included in the analysis. It's possible that the recency of the COVID-19 pandemic may have also affected the results of this study (i.e., that, given more time, research teams may have shared more research materials in CTG), especially as the majority (80%) didn't have a completed status. Even so, during pandemics the rapid dissemination of research materials is critical, and this study provides valuable insight into the current state of these sharing intentions and practices.

As indicated by this study, improvements can be made to the discoverability of research materials in CTG records for federally funded COVID-19 studies. Sharing these materials on CTG can increase the discoverability of these materials, and therefore contribute to increasing the validity, transparency, and reusability of clinical research.

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DATA AVAILABILITY STATEMENT

All data and data dictionaries associated with this study can be accessed at the study Github repository at: <https://github.com/weepai/Discoverability-of-supporting-research-materials-for-U.S.-federally-funded-Covid-19-clinical-studies>.

AUTHOR CONTRIBUTIONS

Both authors contributed to the conceptualization, funding acquisition, methodology, validation, and review and editing of the final draft of the manuscript for this project. PW additionally conducted the data curation, formal analysis, investigation, project administration, visualization, and writing of the original draft of the manuscript for this project. VH additionally provided supervision and took on an advisory role for the project.

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SUPPLEMENTAL FILES

- Appendix A
- Appendix B
- Appendix C
- Appendix D

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Effect of librarian collaboration on otolaryngology systematic review and meta-analysis quality

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See end of article for authors' affiliations.

Objective: To determine if librarian collaboration was associated with improved database search quality, search reproducibility, and systematic review reporting in otolaryngology systematic reviews and meta-analyses.

Methods: In this retrospective cross-sectional study, PubMed was queried for systematic reviews and meta-analyses published in otolaryngology journals in 2010, 2015, and 2021. Two researchers independently extracted data. Two librarians independently rated search strategy reproducibility and quality for each article. The main outcomes include association of librarian involvement with study reporting quality, search quality, and publication metrics in otolaryngology systematic reviews and meta-analyses. Categorical data were compared with Chi-Squared tests or Fisher's Exact tests. Continuous variables were compared via Mann Whitney U Tests for two groups, and Kruskal-Wallis Tests for three or more groups.

Results: Of 559 articles retrieved, 505 were analyzed. More studies indicated librarian involvement in 2021 (n=72, 20.7%) compared to 2015 (n=14, 10.4%) and 2010 (n=2, 9.0%) (p=0.04). 2021 studies showed improvements in properly using a reporting tool (p<0.001), number of databases queried (p<0.001), describing date of database searches (p<0.001), and including a flow diagram (p<0.001). Librarian involvement was associated with using reporting tools (p<0.001), increased number of databases queried (p<0.001), describing date of database search (p=0.002), mentioning search peer reviewer (p=0.02), and reproducibility of search strategies (p<0.001). For search strategy quality, librarian involvement was associated with greater use of "Boolean & proximity operators" (p=0.004), "subject headings" (p<0.001), "text word searching" (p<0.001), and "spelling/syntax/line numbers" (p<0.001). Studies with librarian involvement were associated with publication in journals with higher impact factors for 2015 (p=0.003) and 2021 (p<0.001).

Conclusion: Librarian involvement was associated with improved reporting quality and search strategy quality. Our study supports the inclusion of librarians in review teams, and journal editing and peer reviewing teams.

Keywords: Systematic reviews; meta-analyses; otolaryngology; librarians; reproducibility



See end of article for supplemental content.

INTRODUCTION

Systematic reviews, including meta-analyses, have become a hallmark of holistically unifying research. For health disciplines, these studies were first established in the early 1990s by the founding of the Cochrane Collaboration [1]. Despite the increase in quantity over the past few years, systematic review quality and adherence to reporting standards have remained highly variable [2-4].

As the quantity of systematic review publications increased and formalized guidelines were established, the services of medical librarians (also known as health information professionals or medical information specialists) have evolved to encompass and facilitate these

studies [5]. Oftentimes, the medical librarian's role in research is assumed to be mainly focused on knowledge organization and access. However, librarians have expertise in conducting literature searches, managing citations, creating data extraction and quality assessment forms, peer-reviewing searches, writing or editing portions of manuscripts, performing statistical analyses, or acting as methodology consultants for research teams [6, 7]. In addition to contributing expertise, librarians spend a considerable amount of time on systematic review tasks and do not always receive recognition for their efforts [8, 9]. For example, a study found that librarians spend an average of 26.9 hours (median 18.5 hours) for a single systematic review [8].

Many organizations that guide best practices for systematic reviews recommend involving librarians in the research process. The National Academies of Sciences, Engineering, and Medicine (formally the Institute of Medicine) recommends working with a librarian or other information specialist to plan and peer review the search strategy [10]. Likewise, the Cochrane Collaboration recommends that review authors seek guidance from a medical librarian on the development and documentation of the search strategy [11]. The Medical Library Association (MLA) released a statement, which was cosigned by the Canadian Health Libraries Association/Association des bibliothèques de la santé du Canada (CHLA/ABSC), advocating for librarian co-authorship on evidence synthesis publications, including guidelines and systematic reviews [12]. A strong and comprehensive systematic review search strategy can ameliorate several types of reporting biases, including publication bias, language bias, citation bias, outcome reporting bias, time-lag bias, and location bias [10, 13]. These recommendations for librarian collaboration on systematic reviews aim to increase adherence to reporting guidelines and improve systematic review search quality.

In response to these recommendations, several studies have examined the value of including librarians in the systematic review process. These studies found low rates of librarian acknowledgment or co-authorship, yet involvement of librarians yielded improved search quality, better adherence to reporting standards, and lower risk of bias [1, 4, 6, 13-15]. Several of these studies were limited to certain journals within one or a few medical specialties (e.g., dentistry, cardiology, or pediatrics), and none have examined otolaryngology [16]. Additionally, many of these studies were published before 2019, and numerous systematic reviews were conducted after this time. This study addresses the gap in published literature for otolaryngology researchers and clinicians, provides further justification for the inclusion of librarians on otolaryngology systematic review teams, and contributes evidence of quantifiable changes in search strategy quality when medical librarians are involved. Therefore, our study aims to 1) elucidate the systematic review reporting quality and literature search quality of otolaryngology literature, and 2) investigate the effect of librarian involvement on search quality, search reproducibility, and systematic review reporting in otolaryngology systematic reviews and meta-analyses.

METHODS

Study Design and Participants

For this retrospective cross-sectional study, otolaryngology journals were selected using Journal Citation Reports™ [17]. From the journals in the “OTORHINOLARYNGOLOGY - SCIENCE” category, three researchers (MS, TG, TM) independently reviewed

and selected journals based on pre-defined eligibility criteria. Inclusion criteria consisted of English language, clinically focused, otolaryngology specific, and indexed in MEDLINE. The librarians (EB, RW) identified the journals that were indexed in MEDLINE, as these journals passed the rigorous, multi-step, quality control process required by the National Library of Medicine [18]. Journals were excluded if they were non-English language, non-clinically focused, non-otolaryngology specific, and not indexed in MEDLINE. Non-English language articles were excluded due to the lack of funding for translation services or reliable translation software.

PubMed was queried to identify systematic reviews and meta-analyses in included otolaryngology journals. To identify trends over time, studies from 2010, 2015, and 2021 were included. Due to the number of articles retrieved, each year was limited to a period of six months, beginning January 1 and ending June 30. Publication dates were determined by using the “Custom Range Publication Date” filter, equivalent to using the [dp] or [pdat] field tags, in PubMed. The full search strategy is shown in Appendix A.

Retrieved articles were uploaded to Covidence systematic review software for screening [19]. Two researchers (MS, TG) independently performed title/abstract screening followed by full-text screening using pre-defined inclusion and exclusion criteria. Articles were included if the article title, abstract, or text indicated the study was a systematic review or meta-analysis; the articles were published in the selected otolaryngology journals; and the article was published between 1/1/10 - 6/30/10, 1/1/15 - 6/30/15, 1/1/21 - 6/30/21. Articles were excluded if they discussed a basic science topic, were non-English language or if the full text was irretrievable. Full-text articles were retrieved via library subscriptions, interlibrary loan, and outreach to authors.

Data Collection

Two researchers (MS, TG) independently extracted data from the selected articles using a customized data extraction form (Appendix B). The two librarians (EB, RW) provided consensus over any disagreements in the original data extraction process. The following data elements were extracted: journal name, publication type, level of librarian involvement, reporting guideline followed, number of databases searched, dates of database searches, database limits and filters, search peer review by a second librarian, flow diagram inclusion, grey literature searched, and citation searching performed. Journal impact factors were collected for 2010, 2015, and 2021 according to Journal Citations Report™ [17]. If supplemental files containing search strategies were missing from the journal website, corresponding authors were contacted in an attempt to obtain those files.

In this study, four types of librarian involvement were identified: no acknowledgment, mentioned in text, acknowledgment, and co-authorship. "No acknowledgment" indicated that a librarian was not mentioned in the text, acknowledgments, or author byline. For "librarian mentioned in the text," authors specified in the text of the article, normally the methods section, that a librarian assisted with search strategy development. "Librarian acknowledgment" was defined as a formal acknowledgment at the end of a manuscript. The final type, "librarian co-authorship," means a librarian was identified in the author byline. This determination was made by examining author credentials or degrees, departmental affiliations, or by searching author names in institutional directories.

Two librarians (EB, RW) independently rated the reproducibility and quality of the search strategy for each included article. A reproducible search strategy was defined as a search strategy that was sufficiently described and could be replicated in the appropriate database with minimal effort. This would include fully described search strategies, or a combination of features of reproducible search strategies. These features included, but were not limited to, PICO tables, keywords, and Boolean operators. For articles that included at least one reproducible search strategy, six elements were rated: 1) Translation of the research question, 2) Boolean & proximity operators, 3) Subject headings, 4) Text word searching, 5) Spelling, syntax, and line numbers, 6) Limits and filters. These six elements were based on The Peer Review of Electronic Search Strategies (PRESS) checklist [20]. PRESS is a

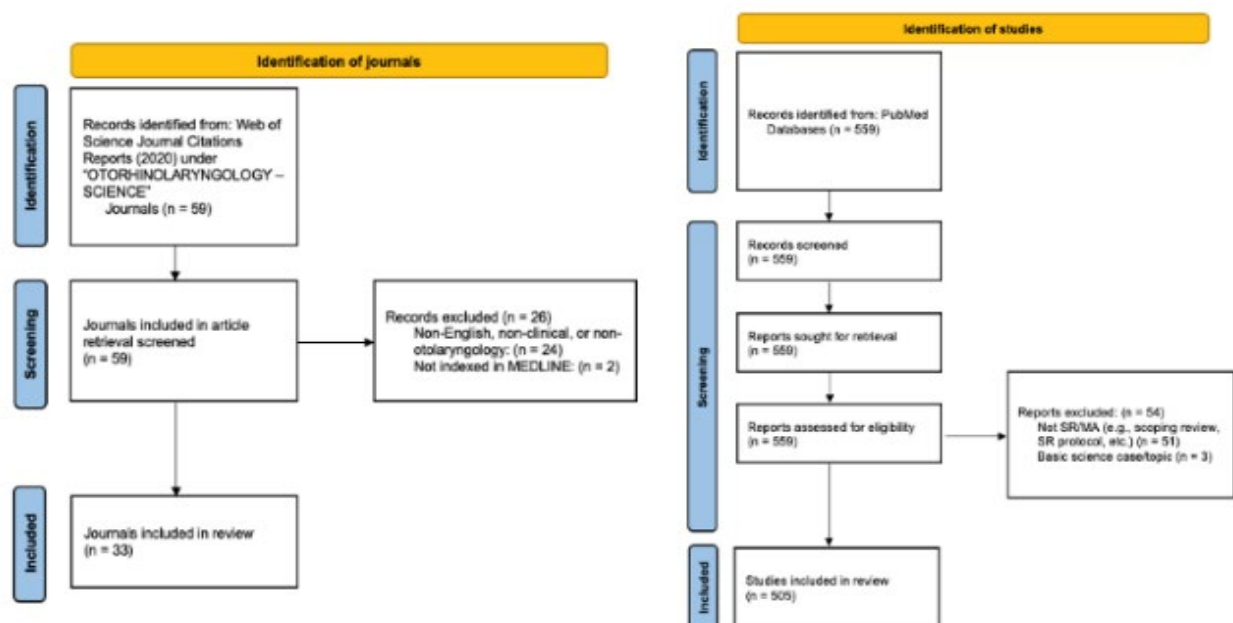
validated structured tool for the peer review of electronic literature search strategies. Each of the six elements is rated "no revisions," "revisions suggested," or "revisions required." For our study, this scale was adapted to a Likert scale, ranging from 1 (low quality) to 3 (high quality) [21]. See Appendix C for the search quality form. Articles where the search was conducted by an author of this study were blinded and sent to two additional librarians (CA, IL) for quality assessment.

Data Analysis

All data were analyzed using SPSS v27.0.1 (IBM Corporation, Armonk, NY). For Likert scale ratings on search strategy quality, interrater agreement was assessed via Cohen's Kappa statistic. Level of interrater agreement was classified according to Landis and Koch's criteria [22]. The Likert scale scores provided by each librarian were averaged for analyses.

All data were assessed for normality via Shapiro-Wilk Tests. Categorical data were presented as counts (% whole) and compared with Chi-Squared tests. For analyses of two groups vs. two groups, and one grouping had fewer than 10 counts, Fisher's Exact test was used instead of Chi-Squared. Continuous variables were presented as median (25-75% interquartile range) and compared via Mann Whitney U Tests for two groups, and Kruskal-Wallis Tests for three or more groups. Because of the low number of studies from 2010, these studies were not separately analyzed in the comparison of search strategy quality.

Figure 1 Flow diagram of journal and article inclusion.



RESULTS

The flow diagrams for journal and article inclusion are shown in Figure 1. Of 59 journals, 33 were included for article retrieval from PubMed. Of 559 articles retrieved, 505 were included for data extraction and analysis. All data collected did not exhibit normality.

Temporal Changes in Reporting of Systematic Reviews and Meta-Analyses

Table 1 compares the reporting quality of systematic reviews and meta-analyses by year. Significantly more librarians were co-authors in 2021 (n=34, 9.8%) compared to 2015 (n=2, 1.5%) and 2010 (n=0, 0.0%) (p=0.04). Conversely, significantly fewer studies were unclear or did not mention librarian involvement in 2021 (n=276, 79.3%) compared to 2015 (n=121, 89.6%) and 2010 (n=20, 90.9%) (p=0.04).

Systematic review and meta-analysis reporting quality improved in 2021 compared to prior years in using a reporting tool (p < 0.001), number of databases queried (p < 0.001), describing the date of database searches (p < 0.001), and including a flow diagram (p < 0.001). No significant difference was seen for mentioning a peer reviewer for search strategies, searching grey literature, performing citation searching, and providing reproducible search strategies. The Preferred Reporting Items for

Systematic Reviews and Meta-Analyses (PRISMA) reporting checklist [23, 24] was the most frequently used tool.

Librarian Involvement and Study Reporting Quality

Table 2 compares the reporting of systematic reviews and meta-analyses with vs. without librarian involvement. There were statistically significant differences with regards to using a reporting tool (p < 0.001), number of databases queried (p < 0.001), describing the date of database search (p = 0.002), mentioning of a search strategy peer reviewer (p = 0.02), and reproducibility of search strategies (p < 0.001). No significant difference was seen for querying at least three databases, describing limits/filters, including a flow diagram, searching grey literature, and performing citation searching. When comparing librarians as co-authors vs. librarians involved without co-authorship, the only statistically significant difference seen was that studies involving librarian co-authors more frequently reported grey literature searching with details provided.

Librarian Involvement and Search Strategy Quality

Appendix D shows the descriptive statistics and interrater agreement for Likert scale ratings of search strategy quality. The greatest agreement was in “subject headings”

Figure 2 Box Plots of Median Quality of Search Strategy.

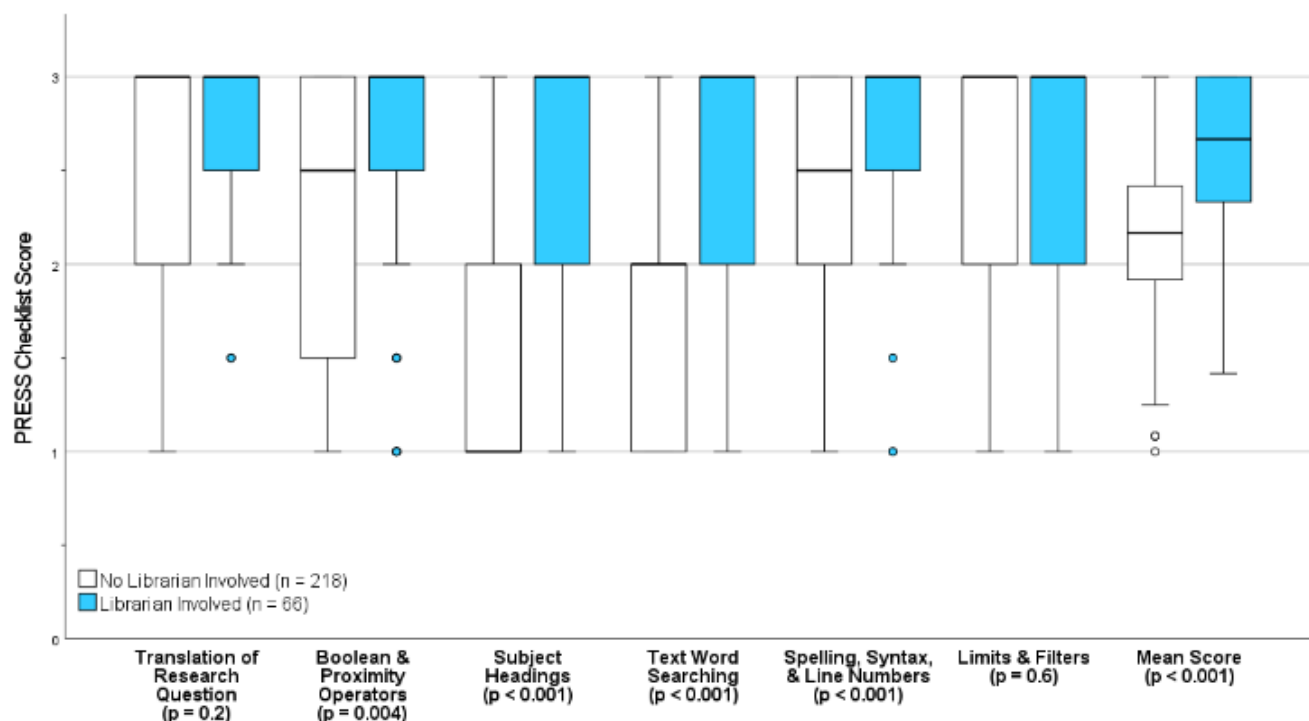


Table 1 Comparing Year of Publication for Reporting Quality of Systematic Reviews and Meta-Analyses

	2010 (n=22)	2015 (n=135)	2021 (n=348)	Comparing All Years	Comparing 2015 to 2021
Study Type (n (%))					
Systematic Review	16 (72.7)	79 (58.5)	165 (47.4)	p = 0.005	p = 0.007
Meta-Analysis	3 (13.6)	23 (17.0)	45 (12.9)		
Systematic Review + Meta-Analysis	3 (13.6)	33 (24.4)	138 (39.7)		
Librarian Involvement (n (%))					
Co-author	0 (0.0)	2 (1.5)	34 (9.8)	p = 0.04	p = 0.01
Acknowledgement	1 (4.5)	9 (6.7)	27 (7.8)		
Mentioned in Text	1 (4.5)	3 (2.2)	11 (3.2)		
Unclear or Not Mentioned	20 (90.9)	121 (89.6)	276 (79.3)		
Systematic Review / Meta-Analysis Reporting Tool Used (n (%))					
Cochrane Handbook of Systematic Reviews of Interventions	1 (4.5)	2 (1.5)	2 (0.6)	p < 0.001	p < 0.001
Centre for Reviews and Dissemination	0 (0.0)	1 (0.7)	0 (0.0)		
MOOSE	0 (0.0)	0 (0.0)	6 (1.7)		
PRISMA	0 (0.0)	35 (25.9)	274 (78.7)		
MOOSE + PRISMA	0 (0.0)	0 (0.0)	5 (1.4)		
QUOROM	0 (0.0)	1 (0.7)	0 (0.0)		
Unclear or Unmentioned	21 (95.5)	96 (71.1)	61 (17.5)		
Number of Databases Queried					
Unclear or Not Listed	1 (4.5)	3 (2.2)	1 (0.3)	p < 0.001	p < 0.001
Mean (SD)	4.0 (4.5)	3.3 (3.2)	3.6 (1.5)		
Median (25-75 IQR)	3.0 (2.0 – 4.0)	3.0 (2.0 – 4.0)	3.0 (3.0 – 4.0)		
Range	1 – 20	1 - 30	1 - 12		
Date of Database Search Described (n (%))					
No Date Listed	7 (31.8)	31 (23.0)	48 (13.8)	p < 0.001	p < 0.001
Month, Year Listed	12 (54.5)	66 (48.9)	133 (38.2)		
Day, Month, Year Listed	3 (13.6)	38 (28.1)	167 (48.0)		
Limits / Filters Described (n (%))					
Described for at least one database	17 (77.3)	66 (48.9)	161 (46.3)	p = 0.03	p = 0.4
Unclear or Not Mentioned	1 (4.5)	7 (5.2)	10 (2.9)		

No Limits / Filters Described	4 (18.2)	62 (45.9)	177 (50.9)		
Search Strategy Peer Review Mentioned (n (%))					
Yes	0 (0.0)	0 (0.0)	4 (1.1)	p = 0.4	p = 0.58 ^a
No	22 (100.0)	135 (100.0)	344 (98.9)		
Flow Chart Included (n (%))					
Yes	12 (54.5)	109 (80.7)	334 (96.0)	p < 0.001	p < 0.001
No	10 (45.5)	26 (19.3)	14 (4.0)		
Grey Literature Searched (n (%))					
Yes, Details Provided	5 (22.7)	30 (22.2)	76 (21.8)	p = 0.5	p = 0.3
Yes, Details Not Provided	2 (9.1)	15 (11.1)	59 (17.0)		
No or Not Mentioned	15 (68.2)	90 (66.7)	213 (61.2)	p = 0.5	p = 0.3
Citation Searching Performed (n (%))					
Yes, Details Provided	7 (31.8)	58 (43.0)	175 (50.3)	p = 0.1	p = 0.3
Yes, Details Not Provided	6 (27.3)	18 (13.3)	42 (12.1)		
No or Not Mentioned	9 (40.9)	59 (43.7)	131 (37.6)	p = 0.1	p = 0.3
Reproducibility of Search Strategy (n (%))					
No Reproducible Search Strategy Provided	15 (68.2)	78 (57.8)	128 (36.8)	p < 0.001	p < 0.001
Reproducible Search Strategy for One Database	5 (22.7)	22 (16.3)	56 (16.1)		
Reproducible Search Strategies for More than One Database	2 (9.1)	35 (25.9)	164 (47.1)	p < 0.001	p < 0.001

Abbreviation: MOOSE, Meta-analyses of Observational Studies in Epidemiology; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; QUOROM, Quality of Reporting of Meta-Analyses.

^a Statistical Test modified to Fisher's Exact test (2-sided).

Table 2 Comparing Librarian Involvement for Reporting Quality of Systematic Reviews and Meta-Analyses

	No Librarian Involvement	Librarian Involvement ^a	Statistical Test	Librarian Co-Author (n=36)	Librarian Involved but not Co-Author ^b (n=52)	Statistical Test
Study Type (n (%))						
Systematic Review	211 (50.6)	49 (55.7)	p = 0.02	19 (52.8)	30 (57.7)	p = 0.9
Meta-Analysis	67 (16.1)	4 (4.5)		2 (5.6)	2 (3.8)	
Systematic Review + Meta-Analysis	139 (33.3)	35 (39.8)		15 (41.7)	20 (38.5)	
Reporting Tool Used (n (%))						
No	162 (38.8)	16 (18.2)	p < 0.001	5 (13.9)	11 (21.2)	p = 0.4
Yes	255 (61.2)	72 (81.8)		31 (86.1)	41 (78.8)	
Number of Databases Queried (median [25-75% IQR])						
	3.0 (2.0 – 4.0)	4.0 (3.0 – 5.0)	p < 0.001	4.0 (3.0 – 5.0)	3.5 (3.0 – 4.75)	p = 0.2
At Least 3 Databases Queried (n (%))						
No	116 (27.8)	21 (23.9)	p = 0.5	3 (8.3)	7 (13.5)	p = 0.5
Yes	301 (72.2)	67 (76.1)		33 (91.7)	45 (86.5)	
Date of Database Search Described (n (%))						
No Date Listed	77 (18.5)	9 (10.2)	p = 0.002	2 (5.6)	7 (13.5)	p = 0.4
Month, Year Listed	183 (43.9)	28 (31.8)		11 (30.6)	17 (32.7)	
Day, Month, Year Listed	157 (37.6)	51 (58.0)		23 (63.9)	28 (53.8)	
Limits/Filters Described (n (%))						
For at least one database	203 (48.7)	41 (46.6)	p = 0.7	19 (52.8)	22 (42.3)	p = 0.6
Unclear or Not Mentioned	16 (3.8)	2 (2.3)		1 (2.8)	1 (1.9)	
None Described	198 (47.5)	45 (51.1)		16 (44.4)	29 (55.8)	
Search Strategy Peer Review Mentioned (n (%))						
No	416 (99.8)	85 (96.6)	p = 0.02 ^c	35 (97.2)	50 (96.2)	p = 1.0
Yes	1 (0.2)	3 (3.4)		1 (2.8)	2 (3.8)	
Flow Chart Included (n (%))						
No	45 (10.8)	5 (5.7)	p = 0.2	1 (2.8)	4 (7.7)	p = 0.6
Yes	372 (89.2)	83 (94.3)		35 (97.2)	48 (92.3)	
Grey Literature Searched (n (%))						
Yes, Details Provided	84 (20.1)	27 (30.7)	p = 0.1	15 (41.7)	12 (23.1)	p = 0.03
Yes, Details Not Provided	64 (15.3)	12 (13.6)		7 (19.4)	5 (9.6)	

No or Not Mentioned	269 (64.5)	49 (55.7)		14 (38.9)	35 (67.3)	
Citation Searching Performed (n (%))						
Yes, Details Provided	197 (47.2)	43 (48.9)	p = 0.4	16 (44.4)	27 (51.9)	p = 0.2
Yes, Details Not Provided	51 (12.2)	15 (17.0)		4 (11.1)	11 (21.2)	
No or Not Mentioned	169 (40.5)	30 (34.1)		16 (44.4)	14 (26.9)	
Reproducibility of Search Strategy (n (%))						
None	199 (47.7)	22 (25.0)	p < 0.001	8 (22.2)	14 (26.9)	p = 0.9
Provided for One Database	67 (16.1)	16 (18.2)		7 (19.4)	9 (17.3)	
Provided for > 1 Database	151 (36.2)	50 (56.8)		21 (58.3)	29 (55.8)	

Data represented with n (%) unless otherwise specified. Chi-Squared Test was used for categorical variables.

^aLibrarian co-author, mentioned-in text, formal acknowledgment.

^bLibrarian mentioned-in text, formal acknowledgment.

^cStatistical test modified to Fisher's Exact test (2-sided).

Table 3 Comparing Librarian Involvement for Search Strategy Quality

	Librarian Not Involved	Librarian Involved ^a	Mann-Whitney U Test	Librarian Co-Author	Librarian Involved but not Co-Author ^b	Mann-Whitney U Test
Studies Across All Years (Median (IQR))						
Number of Studies ^c	n = 218	n = 66	NA	n = 28	n = 38	NA
Translation of Research Question	3.0 (2.0 – 3.0)	3.0 (2.5 – 3.0)	p = 0.2	3.0 (2.5 – 3.0)	3.0 (2.5 – 3.0)	p = 0.4
Boolean & Proximity Operators	2.5 (1.5 – 3.0)	3.0 (2.5 – 3.0)	p = 0.004	3.0 (2.6 – 3.0)	3.0 (1.9 – 3.0)	p = 0.2
Subject Headings	1.0 (1.0 – 2.0)	3.0 (2.0 – 3.0)	p < 0.001	3.0 (2.5 – 3.0)	3.0 (1.0 – 3.0)	p = 0.1
Text Word Searching	2.0 (1.0 – 2.0)	3.0 (2.0 – 3.0)	p < 0.001	3.0 (2.0 – 3.0)	2.5 (2.0 – 3.0)	p = 0.06
Spelling/Syntax/Line Numbers	2.5 (2.0 – 3.0)	3.0 (2.4 – 3.0)	p < 0.001	3.0 (2.1 – 3.0)	2.8 (2.4 – 3.0)	p = 0.6
Limits/Filters	3.0 (2.0 – 3.0)	3.0 (2.0 – 3.0)	p = 0.6	3.0 (2.0 – 3.0)	3.0 (2.0 – 3.0)	p = 0.7
Overall Mean Score	2.2 (1.9 – 2.4)	2.7 (2.3 – 3.0)	p < 0.001	2.8 (2.4 – 3.0)	2.6 (2.2 – 2.9)	p = 0.2
Studies Published in 2015 (Median (IQR))						
Number of Studies	n = 50	n = 7	NA	n = 1	n = 6	NA
Translation of Research Question	2.5 (2.0 – 3.0)	3.0 (2.0 – 3.0)	p = 0.2	NA	NA	NA
Boolean & Proximity Operators	2.5 (1.0 – 3.0)	3.0 (1.0 – 3.0)	p = 0.4	NA	NA	NA
Subject Headings	1.0 (1.0 – 2.0)	3.0 (1.0 – 3.0)	p = 0.008	NA	NA	NA
Text Word Searching	1.5 (1.0 – 2.0)	3.0 (3.0 – 3.0)	p = 0.002	NA	NA	NA
Spelling/Syntax/Line Numbers	2.5 (2.0 – 3.0)	3.0 (1.5 – 3.0)	p = 0.3	NA	NA	NA

Limits/Filters	2.5 (1.5 – 3.0)	3.0 (2.5 – 3.0)	p = 0.3	NA	NA	NA
Overall Mean Score	2.0 (1.8 – 2.3)	2.9 (2.2 – 3.0)	p = 0.01	NA	NA	NA
Studies Published in 2021 (Median (IQR))						
Number of Studies	n = 161	n = 59	NA	n = 27	n = 32	NA
Translation of Research Question	3.0 (2.5 – 3.0)	3.0 (2.5 – 3.0)	p = 0.9	3.0 (2.5 – 3.0)	3.0 (2.5 – 3.0)	p = 0.4
Boolean & Proximity Operators	3.0 (2.0 – 3.0)	3.0 (2.5 – 3.0)	p = 0.01	3.0 (2.5 – 3.0)	3.0 (2.0 – 3.0)	p = 0.2
Subject Headings	1.0 (1.0 – 2.0)	3.0 (2.0 – 3.0)	p < 0.001	3.0 (2.5 – 3.0)	3.0 (1.1 – 3.0)	p = 0.1
Text Word Searching	2.0 (1.0 – 2.0)	2.5 (2.0 – 3.0)	p < 0.001	3.0 (2.0 – 3.0)	2 (2.0 – 3.0)	p = 0.03
Spelling/Syntax/Line Numbers	2.5 (2.0 – 3.0)	3.0 (2.5 – 3.0)	p = 0.002	3.0 (2.0 – 3.0)	2.5 (2.5 – 3.0)	p = 0.7
Limits/Filters	3.0 (2.0 – 3.0)	3.0 (2.0 – 3.0)	p = 0.7	3.0 (2.0 – 3.0)	3.0 (2.0 – 3.0)	p = 0.7
Overall Mean Score	2.3 (2.0 – 2.5)	2.7 (2.3 – 3.0)	p < 0.001	2.8 (2.4 – 3.0)	2.6 (2.1 – 3.0)	p = 0.2

Abbreviation: NA, Not analyzed due to insufficient data. Studies published in 2010 were not analyzed separately due to an insufficient amount of data.

^aLibrarian co-author, mentioned-in text, formal acknowledgment.

^bLibrarian mentioned-in text, formal acknowledgment.

^cNumber of studies decreased from previous analyses because not all included studies provided a reproducible search strategy.

(Kappa value 0.90 [0.89-0.94]), and the weakest was seen in “spelling/syntax/line numbers” (Kappa value 0.47 [0.38 – 0.56]).

Table 3 shows differences in search strategy quality grouped by levels of librarian involvement. Librarian involvement was associated with significant improvements in “Boolean & proximity operators” ($p=0.004$), “subject headings” ($p < 0.001$), “text word searching” ($p < 0.001$), and “spelling/syntax/line numbers” ($p < 0.001$). When comparing librarians as co-authors to librarian involvement without co-authorship, there were no statistically significant differences in search quality. However, trends toward significance were seen, such as in “text word searching” ($p=0.06$).

Analyses examining studies published in 2021 found improvements in search quality that mirrored analyses examining all years aggregately. These improvements again included “Boolean & proximity operators” ($p=0.01$), “subject headings” ($p < 0.001$), “text word searching” ($p < 0.001$), and “spelling/syntax/line numbers” ($p = 0.002$). When comparing librarians as co-authors to librarian involvement without co-authorship, statistically significant difference was seen with librarian co-authors for “text word searching” ($p = 0.03$). Figure 2 shows box plots illustrating the quality of search strategies comparing any librarian involvement (regardless of co-authorship) versus no librarian involvement.

Librarian Involvement and Publication Metrics

Appendix E shows differences in Journal Impact Factor when comparing different levels of librarian involvement. Journal impact factors were higher for articles with librarian involvement in 2015 ($p = 0.003$) and 2021 ($p < 0.001$). Impact factors were not higher with for articles published with librarian co-authors as compared to librarian involvement without co-authorship (2010 $p = 0.03$, 2015 $p = 0.3$, 2021 $p = 0.9$).

DISCUSSION

Our study provided the first investigation of librarian collaboration and temporal changes in otolaryngology systematic reviews and meta-analyses. In comparing studies published in 2010, 2015, and 2021, there were significant improvements in adherence to reporting standards. However, several deficits in consistent reporting were still noted in 2021. There was significantly more collaboration with librarians, which could in part account for some improvements noted between years. Librarian involvement was associated with several statistically significant improvements in reporting quality of systematic reviews, as well as search strategy quality. Studies involving librarians were generally published in journals with higher impact factors. There was no

statistically significant difference in journal impact factors between studies published with librarian co-authors compared to studies with librarians involved but not co-authors. However, some p-values approached but did not reach 0.05, which suggested that additional data and greater power could have led to statistically significant differences in journal impact factors between studies with librarians involved as co-authors and those with librarians in other roles.

Reporting Quality of Systematic Reviews in Otolaryngology

Reporting tools were designed to facilitate transparent, complete, and accurate reporting of systematic reviews and meta-analyses. Table 1 shows that the use of a reporting tool increased from 28.9% in 2015 to 82.5% in 2021. Despite this increase, our study found significant discrepancies in proper adherence. Based on Table 1, adherence to the PRISMA checklist and PRISMA for Searching (PRISMA-S) extension was inadequate in 2021, as 36.8% did not provide a reproducible search strategy, and 52.0% did not provide the exact date that database searching was conducted. Some areas of reporting were adequately addressed by 2021, including describing limits and filters (97.1%) and using a flow diagram (96.0%). However, 61.2% did not report whether they searched grey literature, 37.6% did not report whether they performed citation searching, and 20.4% did not query at least 3 databases.

Another consideration when comparing the reporting quality in systematic reviews is the major revision that was made to PRISMA in 2020 [23]. Articles published in 2015 would have utilized the PRISMA 2009 reporting guidelines, while articles published in 2021 may have used either the original 2009 guidelines, or the revisions released in 2020. The major revisions to PRISMA in 2020 should not have impacted whether a systematic review reported the utilization of a reporting tool.

The reporting recommendations by PRISMA and the Cochrane Handbook for Systematic Reviews of Interventions provide structured guidance on the methodology and reporting of comprehensive literature searches [11, 23-25]. As such, lack of adherence to reporting tools in systematic reviews and meta-analyses may result in the omission of potentially relevant articles due to a lower quality search strategy. Regardless of librarian involvement, the conduct and reporting standards of systematic reviews in otolaryngology could benefit from stricter publication criteria and pre-publication screening.

Librarian Collaboration and Reporting Quality

Concordant with the literature for other medical specialties, our study found that otolaryngology

systematic reviews with better reporting quality were associated with librarian involvement. Several studies have demonstrated the benefits of including librarians in systematic review teams. Specifically, librarian collaboration was associated with a higher likelihood of: searching at least three databases, providing at least one reproducible search strategy, including more search terms in search strategies, better reporting scores in methodology sections, better search quality, presenting flow diagrams, and searching grey literature [1, 4, 6, 13, 14]. However, our study found that librarians were only involved in 20.7% of otolaryngology systematic reviews published in 2021, and less than half of these (9.8%) included librarian co-authorship. This low level of involvement could be attributed to lack of recognition towards librarian contributions, sometimes referred to as invisible labor [9].

One potential influence on systematic review search quality were the revisions to PRISMA in 2020, specifically whether a reproducible search strategy was provided for more than one database [23]. This was because the original 2009 PRISMA guidelines only required reviews to “present the full electronic search strategy for at least one database” while the 2020 update required reviews to “present the full search strategies for all databases, registers, and websites” [23, 24].

Considering that librarian services are not uniformly available for researchers, mandating the inclusion of librarians in systematic reviews would likely widen disparities in academic publishing. However, librarians have the expertise to peer review search methodology, and their inclusion on peer review teams would help to ensure adherence to reporting tools and reduce the risk of bias. Otolaryngology journals could consider incorporating librarians as reviewers of systematic reviews to further ensure scientific reporting integrity. This suggestion is further supported by a study indicating a high level of interest by medical librarians to serve as peer reviewers for academic journals which led to the creation of a Librarian Peer Review Database [26, 27].

Librarian Collaboration and Search Strategy Quality

To quantify search strategy quality, our study adapted the PRESS checklist. Current methods of grading search strategy quality are affected by a grader’s expertise and skill. Furthermore, a level of subjectivity is introduced by using the PRESS checklist [20]. Additional studies are needed to better develop objective and quantitative search strategy grading tools. Our study demonstrated moderate to substantial interrater agreement which was determined to be sufficient for further analyses.

Concordant with the literature, our study found that librarian collaboration was associated with improved search strategy quality [1, 13]. With librarian involvement the median score almost always was “3,” which indicated

“no revisions necessary.” In contrast, most studies without librarian involvement required significant revisions for “subject headings,” and revisions suggested for “text word searching” and “spelling/syntax/line numbers.” Furthermore, conclusions were consistent when examining only studies published in 2021. Altogether, our study again supports the incorporation of librarians on systematic review and journal editing teams.

We initially hoped to examine the value of peer reviewing search strategies and its association with search strategy quality. However, analysis was not appropriate considering the inadequate number of articles indicating search strategy peer reviewing. Instead, we used librarian co-authorship as a surrogate indicator for greater involvement and investment in search strategy development. Previous literature has noted that librarians as co-authors are associated with improved search strategy quality compared to librarians only mentioned in the text or acknowledged [13]. For our study, search strategy quality mostly did not differ between studies involving librarians as co-authors vs librarians without co-authorship. However, grading scores were generally higher for studies involving librarian co-authors, and a statistically significant increase was seen for studies published in 2021 for “text word searching.” These trends suggest that additional data and greater power could lead to more statistically significant differences.

Librarian Collaboration and Publication Metrics

Our study found that systematic reviews published in 2021 with librarian involvement were associated with publication in otolaryngology journals with higher impact factors. There was no statistically significant association between librarian involvement and high impact factor journals for the systematic reviews published in 2015, but this may be because the study was underpowered. It must be noted that impact factors are not synonymous with the prestige or reputation of a journal. Additionally, access to librarian services varies between researchers, and thus the observed differences may be due to other factors related to resource availability. As our study found that librarian involvement in systematic reviews was associated with higher search quality, this finding may indicate that librarian collaboration may be associated with publication acceptance in a higher impact journal but further research to confirm this is required. Nonetheless, our study supports the collaboration with librarians for systematic reviews and meta-analyses when possible.

Study Limitations

Because of our strict inclusion and exclusion criteria, our study findings are not generalizable to other databases, languages, or non-clinically focused articles. Non-English language articles were not included in our study and may have excluded additional systematic reviews involving librarian involvement. Additionally, a very specific

strategy was used in PubMed to identify systematic reviews and meta-analyses. This method may have excluded articles that were not yet indexed in MeSH or did not self-identify in their title.

This study was dependent on the information published in the articles we reviewed. If a librarian created a search strategy but that information was not stated in the article, the article would have been miscategorized. Librarians are not always credited as authors even if their contributions are in accordance with the International Health Library Associations to International Committee of Medical Journal Editors (ICMJE) authorship criteria [28]. These types of omissions could have led to the underestimating the level of librarian collaboration and the influence of librarian contributions on otolaryngology systematic reviews.

It is important to acknowledge that the PRISMA reporting guidelines originally published in 2009 were revised and updated in 2020 [23, 24]. Updates to the checklist included changes to incorporate more inclusive language, clarifying wording, and requiring a full search strategy for all databases [9, 23]. These changes may have impacted the number of reproducible searches in 2021 to be higher than in previous years. Additionally, the PRESS checklist was published in 2016 and may have indirectly led to an improvement in search quality as institutions may have utilized an internal librarian peer review process that was not mentioned in the text [20].

Many of our statistical comparisons did not show statistical significance. It is important to note that our study did not conduct a power analysis, and thus the minimum number of studies that had to be examined to achieve statistical significance was not pre-determined. As such, a lack of statistical significance may not mean that the relationship does not exist, but rather that another study of greater power may be needed.

Conclusions

Our study provided the first investigation of temporal changes and librarian activity in otolaryngology systematic reviews and meta-analyses. Despite the frequent indication of using reporting tools, several deficits in adequate reporting were still noted in 2021. Librarian collaboration remains sparse in otolaryngology systematic reviews and meta-analyses. However, librarian involvement was associated with improved reporting quality and search strategy quality. Studies involving librarians were also published in journals with higher impact factors.

As the landscape begins to shift towards embracing librarian involvement on systematic reviews through the support of leading systematic review entities (e.g., Cochrane and Johanna Briggs Institute) and national organizations (e.g., MLA and CHLA/ABSC), we are hopeful that librarians will be invited to systematic review

teams and as a part of the journal peer review process. The publication and growing awareness of additional structured guidance on systematic reviews, such as the PRISMA-S extension and the validated PRESS checklist, provides an opportunity to further increase search quality and reproducibility. Future research should include studies more directly examining the quality of recent systematic reviews with librarian co-authors compared to librarian involvement without co-authorship.

Additionally, similar studies of systematic review quality and librarian involvement are needed in other disciplines.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

Raw data for quality assessment and data extraction are stored in Open Science Framework (<https://osf.io/pdz3m/>).

AUTHOR CONTRIBUTIONS

Rachel Whitney: conceptualization, methodology, investigation, data curation, writing (original draft; review and editing), visualization, project administration. Michael C. Shih: conceptualization, methodology, formal analysis, writing (original draft; review and editing), visualization. Tamar Gordis: methodology, formal analysis, writing (review and editing). Shaun A. Nguyen: formal analysis, writing (review and editing), visualization. Ted A. Meyer: writing (review and editing), supervision. Emily Brennan: conceptualization, methodology, investigation, data curation, writing (original draft; review and editing), project administration.

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**SUPPLEMENTAL FILES**

- **Appendix A:** Full Search Strategy
- **Appendix B:** Data Extraction form from Covidence
- **Appendix C:** Quality Assessment form
- **Appendix D:** Table: Agreement Between Two Librarian Raters
- **Appendix E:** Table: Comparing Librarian Involvement for Publication Metrics

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Large-scale systematic review support for guideline development in diabetes precision medicine

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See end of article for authors' affiliations.

Background: Involving librarians as team members can lead to better quality in reviews. To improve their search results, an international diabetes project involved two medical librarians in a large-scale project planning of a series of systematic reviews for clinical guidelines in diabetes precision medicine.

Case Presentation: The precision diabetes project was divided into teams. Four diabetes mellitus types (type 1, type 2, gestational, and monogenic) were divided into teams focusing on diagnostics, prevention, treatment, or prognostics. A search consultation plan was set up for the project to help organize the work. We performed searches in Embase and PubMed for 14 teams, building complex searches that involved non-traditional search strategies. Our search strategies generated very large amounts of records that created challenges in balancing sensitivity with precision. We also performed overlap searches for type 1 and type 2 diabetes search strategies; and assisted in setting up reviews in the Covidence tool for screening.

Conclusions: This project gave us opportunities to test methods we had not used before, such as overlap comparisons between whole search strategies. It also gave us insights into the complexity of performing a search balancing sensitivity and specificity and highlights the need for a clearly defined communication plan for extensive evidence synthesis projects.

Keywords: Systematic review methodology; project management; search strategy development; role of information specialist; teamwork; online collaboration

BACKGROUND

Supporting researchers and clinicians in doing systematic reviews and clinical guidelines is a central task for many medical librarians, highlighting the need for libraries to develop organizational capacity and relevant competencies to support these projects at their institutions [1-3]. There are many roles for librarians in systematic reviews, not only including searching expertise but also methodological advice or suggestions of resources for training [2, 6-8]. Librarian collaboration and peer review of search strategies can lead to collegial learning and ensure quality in systematic reviews [4, 5]. While systematic review support requests from institutional researchers often emerge individually, we were invited to participate in an international large-scale project that sought to plan a series of systematic reviews for the development of clinical guidelines in diabetes precision medicine.

Precision medicine is an approach to optimize the diagnosis, prediction, prevention, or treatment of diabetes by integrating multidimensional data, accounting for individual differences. The major distinction from standard medical approaches is the use of complex data to characterize the individual's health status, predisposition,

prognosis, and likely treatment response. Precision medicine also focuses on identifying patients who do not require treatment or less treatment. Relevant concepts are metabolic context, genomic variation, genes and transcripts, biomarkers and knowledge of lifestyle and environmental risk factors. There are research gaps on many aspects of precision medicine and how it can be translated into clinical practice guidelines [15].

Project Setting

Lund University is a full-scale university with 47,000 students and 7,000 employees.

The Medical Faculty library supports 1,000 researchers and PhD students and 2,900 undergraduate students [9, 10]. Support to literature reviews and evidence-based medicine is offered to in different forms depending on context and target group. The library's systematic review service for researchers and PhD students is currently delivered by five librarians. The service was established in 2014 and continues to grow in number of supported reviews per year. The establishing of Cochrane Sweden [11] in Lund 2017 further enhanced the support to systematic reviews from the library, and led to collaboration with Cochrane Sweden on many areas, such

as search method development, training and support for students and researchers. The team of librarians annually supports 45-65 literature reviews of various formats such as systematic reviews, Cochrane reviews, scoping reviews or clinical guidelines.

In fall 2020 we were approached by a diabetes researcher who was principal investigator (PI) for a large-scale international project. The project aimed to develop guidelines in precision medicine in diabetes, involving more than 100 researchers and clinicians around the world working in teams. The project was a part of Precision Medicine in Diabetes Initiative that was launched 2018 by American Diabetes Association and European Association for the Study of Diabetes [12]. A series of systematic reviews were planned as a basis for guideline development and a consensus report.

The PI had heard of Covidence as an online tool for systematic reviews and asked whether the library provided campus access. At this point, we had tried Covidence in small scale, but we did not have campus access. We were excited to hear about the extensive project and offered our help with Covidence, systematic searching, and methodological guidance. We were therefore happy to be engaged in the project and aimed to contribute to the methodological quality. At the outset of the project, we agreed with the PI to provide acknowledgement level contributions to each publication, choosing not to claim co-authorship as it would be time-consuming to engage deeper in so many reviews. Due to the pandemic in 2020, changes were made in our daily library routines where we switched to online support. This also made it possible for us to engage in a large project like this, as the physical library service was minimized.

Committing to participate in this project even at an acknowledgement contribution level required careful consideration from our library staff. However, following the onset of the COVID-19 pandemic 2020, we had minimized our investment in physical library services, which created additional staff availability to contribute to large projects such as this one. We also decided not to charge for our service to the project, as the PI and the project gave substantial financial contribution to the Covidence campus access, which then was made accessible for all staff and students at Lund University.

CASE PRESENTATION

Start-Up and Search Consultation Plan

Effective communication is essential in systematic review projects, and there are many challenges [16]. Being experienced in systematic review methodology, we were aware of some of the methodological challenges that could occur. We prioritized creating open channels of communication with project administrators and the PI to monitor progress and identify areas where additional help

was needed. Rather than use a fixed support model, we instead let the needs of the PI and teams shape the process. We drafted a general project plan with method guidance tips and links to resources and also offered guidance on protocol development and Prospero registration. The documentation of our work was stored on project platforms where all teams could reach it. The majority of our communications with the PI, project administrators, and research team members took place online using Zoom, Teams, and SharePoint. The teams appreciated that we could transfer method questions and solutions across the teams which helped them forward in the review process.

We used the team structure to plan our search consultations, communication with team coordinators and follow up, as described in Figure 1. The precision diabetes project investigated four types of diabetes: Monogenic, Type 1, Type 2, and Gestational. Each type (except for monogenic diabetes) were divided into four teams, looking at diagnostic, prevention, treatment, prognostics, creating a total of 15 possible teams. Of those teams we supported 14; the groups for Type 1 diabetes diagnostics and Type 1 diabetes prevention merged and the groups for Monogenic and gestational diabetes prognostics did not contact us for assistance.

Figure 1 Search consultation plan and role of information specialists.

Research focus	Research teams per type of diabetes				Information specialists
	Monogenic diabetes	Type 1 diabetes	Type 2 diabetes	Gestational diabetes	
Diagnostics					<ul style="list-style-type: none"> List thesaurus terms & keywords Key papers for sensitivity test Search strategy test, review & modification Documentation & delivery of results Covidence support & methodological advice
Prevention	—				
Treatment					
Prognostics					

Most groups also had subgroups, which led to multiple searches for each group. We had a startup meeting with each group to assess their needs, field questions, and to set the parameters for their searches. Some teams had developed lists of suggested terms, while other teams needed assistance with keyword generation. We then asked for key papers for each research questions for sensitivity testing. All groups gave us input on search terms, sometimes arranged within search blocks. The terms included, for example, diabetes terminology, different proteins, inhibitors, outcomes, risk assessment, diseases, pregnancy and gestation terms, substance or

biomarkers. All terms were dependent on group and research area.

After conferring with the PI and the teams, and after consulting Cochrane Handbook and NICE (National Institute for Health and Care Excellence) guidelines [13, 17], it was decided that two databases, PubMed (National Library of Medicine) and Embase (Elsevier, via embase.com) were considered to be sufficient for the aim of the project. There were some teams who wanted to limit the search to just PubMed but, after consulting us, Embase was also included for better coverage.

Building Complex Searches

The searches and search blocks were constructed and modified according to the search question. Some of the searches could have been based on models often used in systematic reviews like PICO (Patient-Intervention-Control-Outcome) or PEO (Patient/population-exposure-outcome), but for most searches these were not applicable. Instead, we worked with relevant blocks of terms corresponding to the research question. We needed to build them up in other ways, for example:

- Diabetes terms AND biomarker/marker AND outcome
- Diabetes terms AND protein AND drug
- Diabetes terms AND drug AND outcome.

The terms for diabetes were mainly the same within each section. The same Type 1 diabetes terms could be used as a search filter which were applied for most of the Type 1 diabetes searches. Controlled vocabulary was used (MeSH, Emtree), together with a Title/Abstract-search we covered most of the articles. Where the search questions were less well defined the searches would be more complex and multi-stranded searches were conducted [17]. We also used the key papers to check the sensitivity of our searches [13]. The sensitivity test included about five key papers for each search question.

We peer reviewed each other's search strategies, to make sure they were consistent across the databases but allowing for specific thesaurus terms and syntax use appropriate in each database, before running the finalized searches. Often key papers were missing, which we attributed to several different reasons, including:

- Lack of terms in one of the blocks (the most common reason)
- Paper missing from database
- No abstract available
- Older than the suggested date limitations.

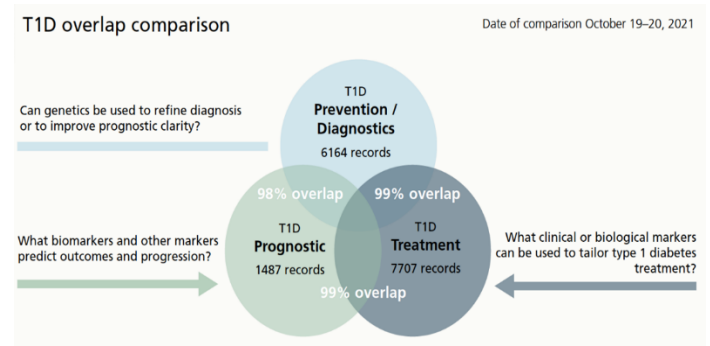
Still, despite all our efforts we needed one or two unorthodox solutions to find all key papers, by adding required terms that were not related to diabetes or study design but would capture key papers.

Overlap Searches

On request from the PI, we made overlap searches to see the overlap in between Type 1 diabetes search strategies and Type 2 diabetes search strategies, which were the diabetes types with most publications. Monogenic and gestational diabetes were more specific and gave narrower result lists. While overlap as a test method have been used to identify convergence among studies in a systematic review [18] and between databases [13], but to our knowledge overlap test of search strategies is not much explored in previous research.

Embase was used to run the overlap test. We hypothesized that Embase would cover most of the content of our PubMed searches and provide an estimation of the overlap between the databases and within the search strategies for each diabetes type. An example of the result from an overlap search is presented in Figure 2.

Figure 2 Overlap comparison search for Type 1 diabetes.



The overlap searches showed that there was a substantial overlap between the searches for each diabetes type, but still searches for all teams retrieved unique papers. Our interpretation of the large overlap was that we had covered the relevant literature, with some redundancy across the searches as an expected side effect and the test revealed the extent of that overlap. The result was used by the PI and teams to collaborate more efficiently across teams. We had not tested overlap search as a method where full and complex search strategies were compared before. It was time-consuming but was highly relevant to the project.

DISCUSSION

The large scale of the diabetes precision medicine review project gave us opportunity to test methods that we had not previously used, such as overlap comparisons of whole search strategies. Working and having meetings online were new concepts to many during the pandemic, however, large-scale projects like this would not be

possible without online collaboration. The online communication platforms and tools for systematic reviews such as Covidence were essential and will continue to be core infrastructure for us. The search consultation plan (Figure 1) was essential to keep track of all the teams and their coordinators, plan our work, do status updates, and find overlaps where we could reuse previous search terms and strategies.

It was difficult to estimate how much time the activities in the review process would take for us as it depended on the teams' requirements and previous review experience. The difficulty to estimate time spent on review activities is also reported in previous research [19]. We initially spent much time on team interviews and search strategy development and testing. When core concepts of the strategies were developed, they could be reused, both within and across teams, with relevant modifications. This was time-efficient and allowed us to produce search results effectively and consistently. More time could then be dedicated to additional guidance in other parts of the review process such as full text selection and management. We did not report specific time for each project or task, but rather made a general estimation of time worked in the project.

The searches sometimes retrieved a very large number of records, especially for Type 1 diabetes and Type 2 diabetes. One challenge was to narrow down the result without losing key papers. Another problem was to find all ways of expressing important terms. Other challenges were communication and expectations. Some teams refocused their research questions and we needed to start over with searches. We had to discuss expectations of screening time, dual screening and explain general sensitivity/specificity of search results for systematic reviews, as some teams had expected narrower results, similar challenges also reported in previous studies [16, 20]. There were both advantages and disadvantages of 'organic' management and communication compared to a fixed service model. An advantage was the flexibility to make changes without unnecessary bureaucracy. A disadvantage was some lack of transparency and expected time estimation.

We chose not to charge for our service and support. In the future, for similar large projects a support model in a two-tiered fashion as suggested by McKeown [2] could be used, where methodological consultation could be billed to a funded researcher's grant [21]. As many services at a research university already operate in this explicit research core model, we anticipate that this cost-recovery model would be well-understood by institutional researchers.

Visualizing the communication plan was essential in this complex project, to ensure efficient workflow in each part, to avoid redundant work and focus on quality. We found new ways to work efficiently to maximize quality and

minimize redundant work in our support to the series of systematic reviews. The complex research questions and need for complex tailored search strategies will help us recognize similar needs in the future and respond with appropriate search strategies, based on core guidelines and handbooks. Our experiences from the project helped establish the expansion of our general systematic review support to our faculty, now going beyond searching to include additional guidance in methodology and tools for systematic reviews.

The diabetes precision medicine project has so far published a consensus report and 12 of 16 planned systematic reviews. The consensus report is published in *Nature Medicine* [22] and the series of systematic reviews is available via *Nature Communications* [23].

LIMITATIONS

There are a few noteworthy limitations related to the size of the project. Had the reviews requests been presented traditionally one by one, we might have had time and resources to use a more traditional systematic review methodology. However, then we would not have been able to deliver results within the expected time frame (2 years) of the project. In our case, the number of simultaneous reviews called for effective review management and transparency in methodological considerations. Diabetes is a research area with a significant number of publications, where our role in the project was to help the teams get a reasonable and relevant result to work with. The specific topic, precision medicine in diabetes, also led to variations in how to balance sensitivity-specificity and some variations in the use of study design filters, depending on each team's requirements and focus of research questions. We consulted handbooks, such as *Cochrane Handbook* [13] and *NICE guidelines* [17] for appropriate conduct, together with sensitivity tests of our strategies using key papers provided by the teams. Given additional time and resources, external peer review of our search strategies could have contributed to additional quality of the result.

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DATA AVAILABILITY STATEMENT

Data in the format of search strategies underlying our work are either available as supplementary material to the published papers described in this study or can be obtained from the authors. Other data associated with this article cannot be made publicly available because they

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contain personally identifiable information. Access to the data can be requested from the corresponding author and may be subject to Institutional Review Board restrictions.

AUTHOR CONTRIBUTIONS

Maria Björklund: Conceptualization, methodology, project administration, visualization, writing original draft, writing–review & editing; Krister Aronsson: Conceptualization, methodology, project administration, visualization, writing original draft, writing–review & editing.

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Implementation science: why should we care?

Frances Chu

See end of article for authors' affiliations.

There is a 17-year gap between the publication of research which proves an intervention is efficacious and effective and the implementation of that same intervention into practice [1]. In behavioral health, only 14% of successful interventions are integrated into actual practice [2]. As such, Implementation Science is envisioned to address the research to practice gap. This research methodology becomes important as it looks to investigate how to get interventions to become embedded in practice and de-implement unproven or disproven interventions that may be harmful and/or ineffective for patients.

The aim of this commentary is to raise awareness of health sciences librarians/information specialists about this research arena and encourage health sciences librarians to envision how they could be involved in implementation science projects and teams or even use implementation science in their practice.

Keywords: Implementation Science

WHAT IS IMPLEMENTATION SCIENCE?

Implementation science was described in 2006 by Eccles and Mittman [3] and has been defined as “the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and hence, to improve the quality and effectiveness of health services or care” [3]. Other synonyms and similar terms are dissemination and implementation, implementation research, knowledge transfer, knowledge translation, knowledge integration, research utilization, improvement science, etc. [4]. The goal of implementation science focuses on the processes to introduce and embed solutions to problems into a health system or community [5]. Peters [5] stated, “the intent is to understand what, why, and how interventions work in “real world” and to test approaches to improve them”. In other words, this research area is focused on strategies and tactics to enhance adoption, implementation, scaling up, and sustainability of evidence-based interventions which could be programs, practices, principles, procedures, products, pills and/or policies that will change health behaviors, health outcomes or health environments [6].

WHAT IS THE DIFFERENCE BETWEEN IMPLEMENTATION SCIENCE RESEARCH AND EFFECTIVENESS/EFFICACY RESEARCH?

Implementation science must be distinguished from effectiveness/efficacy research. Effectiveness/efficacy research typically has the goal of investigating interventions for specific health problems. Efficacy studies of interventions answer the question of whether an

intervention could work under strict, rigorous conditions while effectiveness (also known as pragmatic) studies of interventions seek to investigate whether the intervention will work in real-world settings. The outcomes of efficacy and effectiveness studies focus on patient outcomes who are typically the targets of the intervention. Implementation studies are focused on how to make these interventions work in a community or health system. Because the focus is on how to make interventions work in real-world settings, the expectation is that the intervention has been demonstrated to be efficacious and effective [7]. Curran [8] describes implementation science versus efficacy/effectiveness research in simplified terms. The intervention or practice or innovation is *The Thing*. Efficacy and effectiveness research investigates whether *The Thing* works. Implementation research studies how to get people and organizations to do *The Thing* and uses implementation strategies or the “stuff we do” to try to help people and organizations to do *The Thing*. Implementation research is interested in outcomes of “how much” and “how well” the people and organizations do *The Thing* [8].

WHAT IS THE DIFFERENCE BETWEEN IMPLEMENTATION SCIENCE AND QUALITY IMPROVEMENT (QI)?

Implementation science must also be distinguished from quality improvement. Although both have the goal of improving healthcare quality with both using similar techniques and methods for conducting the investigation, there are significant differences. QI tends to be local in nature with problems identified at a local level and results of initiatives often not generalizable to other settings [9].

Implementation science starts with the intervention and investigates how to implement that identified intervention in the health system or community [1], and then, aims to spread the implementation beyond a health system or community. Implementation science like effectiveness/efficacy research has the goal to generalize the results beyond the local context.

IMPLEMENTATION SCIENCE AND IMPLEMENTATION STRATEGIES

Because implementation science investigates how to get interventions into practice or the community, the research focuses on “implementation strategies” or “the methods or techniques used to enhance adoption, implementation and sustainment of a program or practice” [10]. The study designs used to research these strategies are the same methods used to examine the interventions. Indeed, Procter [10] stated, “the study of implementation strategies should be approached in a similar fashion as evidence-based interventions, for strategies are in fact a type of intervention.”

WHAT ARE THE THEORIES, MODELS, AND FRAMEWORKS USED IN IMPLEMENTATION SCIENCE?

There are a multitude of theories, models, and frameworks (TMFs) used in implementation science with around 60 TMFs used in studying implementation strategies [11]. Nilsen [4] classified the TMFs into five types:

- Process models

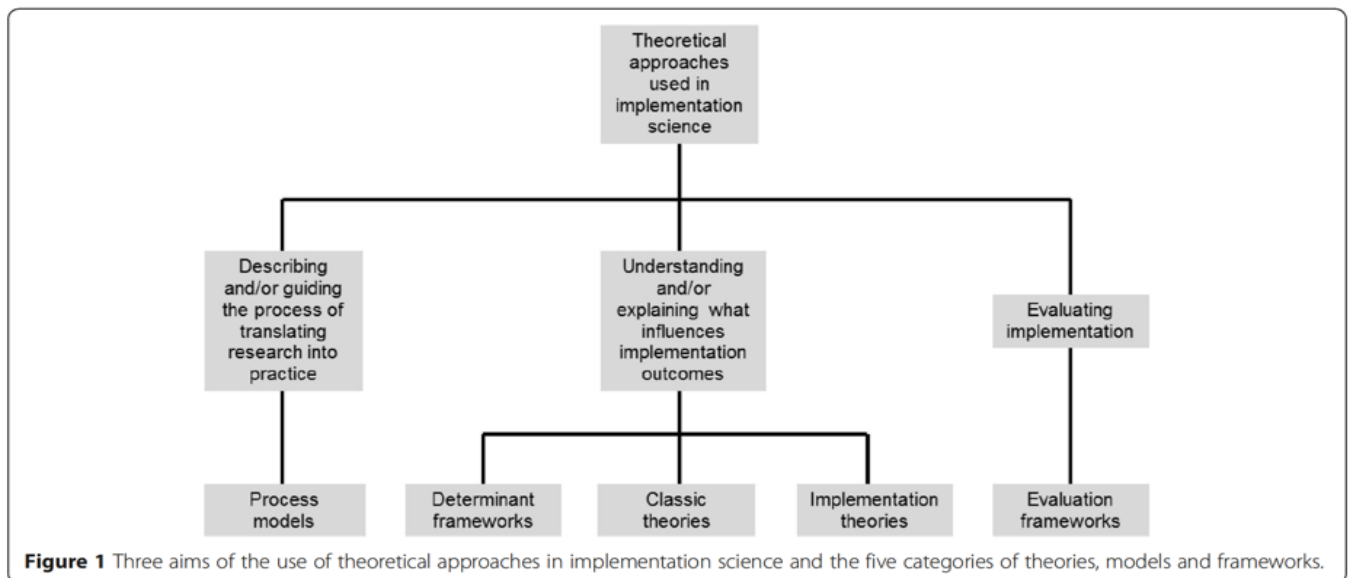
- Determinant frameworks
- Classic theories
- Implementation theories
- Evaluation frameworks

Process models specify steps in the process of translating research into practice. The process models often describe and guide the planning and execution of implementation of an intervention[4]. An example of a process model familiar to hospital librarians working with nurses is the Iowa Model. This model provides nurses with an algorithmic approach to implementing evidence-based interventions starting with identifying an issue to disseminating the results [12]. In 2022, the model expanded to include implementation and sustainability steps [13].

Determinant frameworks guide implementation researchers and practitioners in identifying barriers and facilitators to implementing the intervention. These frameworks aim to understand and/or explain influences on implementation outcomes [4]. The most frequently used determinant framework is the Consolidated Framework for Implementation Research (CFIR). Damschroder et al. [14] developed this framework to help researchers identify barriers and facilitators which can guide assessment, evaluation, and explanations of implementation findings.

Classic theories are theories already used to describe, explain, and predict behavior in individuals and organizations, but are now used to describe, explain, and predict implementation of interventions. These theories come from a variety of fields. From the psychology field, the Theory of Reasoned Action, Social Cognitive Theory,

Figure 1 Nilsen [4] classification of implementation science theories, models, and frameworks.



Theory of Planned Behavior, etc. are examples of theories often used in implementation research. Another example from the field of knowledge utilization is Roger's theory of Diffusion of Innovations. This influential theory is considered a classic theory often used to explain intervention adoption [4].

Implementation theories, on the other hand, have been developed specifically to describe, explain, and predict implementation of interventions. Examples of implementation theories include the Implementation Climate, Absorptive Capacity, Organizational Readiness, Normalization Process Theory, etc. The Normalization Process Theory, as an example, identifies four determinants that explain the change mechanisms and interrelations needed for implementation [4].

Lastly, evaluation frameworks help determine what could be evaluated for implementation success. As an example, two common frameworks from public health used in implementation science are Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) and Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation-Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development (PRECEDE-PROCEED). These frameworks specify aspects that should be evaluated for when implementing interventions [4]. Proctor et al. [15] developed the Implementation Outcome Framework specifically for implementation research. This framework distinguishes implementation outcomes from services and patient outcomes. Ultimately, the implementation researchers may use many categories of TMs in combination to answer their question of how to implement an intervention or study an implementation strategy.

WHAT ARE THE GAPS IN IMPLEMENTATION SCIENCE?

There are still many unanswered questions in implementation science. The largest gap is in the implementation strategies themselves. A major issue is the lack of clarity on the implementation strategies. It is not clear on the individual implementation strategies' definitions and meaning. This issue includes different strategies having the same definitions or meaning, or one strategy having multiple definitions or meanings [16]. As health sciences librarians and information specialists know, consistent terminology aids in searching and browsing for information. Even with this conceptual confusion, there is little evidence on the effectiveness or adverse consequences of the implementation strategies. The implementation science research arena needs to move beyond identifying barriers and facilitators to studying causal mechanisms of implementation strategies while being aware that different strategies may be more effective in the different phases of implementation or in different

contexts [17]. Another concern is that many implementers deploy multiple implementation strategies in addition to the complex interventions. This can confuse the outcomes of the research and make it difficult to evaluate whether the research results are due to the synergistic or antagonistic effects of these multiple implementation strategies and complex interventions [17].

An additional difficulty facing implementation science is the lack of reliable, valid and practical measurements [18], and if there are existing measures, many have not been translated to other languages and cultures. Indeed, much of this research was developed in high-income, English-speaking countries, and there is uncertainty on whether the implementation science research results can be applied in other countries and their local cultural context [19].

Previously, there has been little research about de-implementation and identifying mis-implementation [20]. De-implementation is the process of discontinuing practices that are proven to be ineffective or potentially harmful. Mis-implementation is the mistake of de-implementing effective interventions or the continuation of ineffective interventions [20,21]. There is increasing interest in de-implementation as seen by a recent scoping review searching for frameworks and models that can guide de-implementation [22].

Lastly, implementation science researchers are continuing to investigate new study designs and analytical methods to research implementation strategies and interventions to ensure more rapid implementation of interventions to avoid reproducing the research to practice gap [23].

WHAT CAN HEALTH SCIENCES LIBRARIANS/INFORMATION SPECIALISTS DO TO SUPPORT IMPLEMENTATION SCIENCE?

Implementation science is a transdisciplinary research methodology taking concepts and methods from many fields. As a transdisciplinary field, health sciences librarians could become part of the research team in implementation science research. It is a matter of how health sciences librarians/information scientists can leverage our knowledge and skills for the research team.

Health sciences librarians can continue to provide our usual services like helping to identify and find implementation-focused research. For example, health sciences librarians could help researchers and practitioners of implementation science identify instruments and questionnaires with an implementation science focus, help researchers perform reviews of the literature to summarize information about implementation strategies and help find reporting guidelines about implementation science research. Health sciences librarians' involvement in data management, citation analysis, and researcher impact will also help implementation science teams manage information and

assess the impact of their research. As the field continues to develop and grow, the variety and inconsistency of terminology leads to barriers in synthesizing and applying findings [24]. Health sciences librarians could help researchers with standardized language and controlled vocabulary development. Health sciences librarians' skills in gathering and distilling information in a digestible format is also a service we can provide implementation science teams. Health sciences librarians can also provide implementation scientists with information science theories, models, and frameworks that could potentially inform implementation. An example could be Dervin's sensemaking theory which describes the process of information representation and organization to serve a task like decision-making [25]. Implementation researchers can use this classic theory to explain behavior change and implementation due to the healthcare professionals' assessment of information given to them about the intervention.

HOW CAN IMPLEMENTATION SCIENCE HELP LIBRARIANS?

Librarians have already been using many quality improvement techniques in assessing, evaluating, and sustaining change in library and information services. The same principle can be used with implementation science in that the theories, models, frameworks, and strategies identified and shown to be effective for implementation of an intervention in turn can be used by librarians who are implementing programs, practices, principles, procedures, products, and/or policies. Health sciences librarians can take a more systematic and rigorous approach to how we implement our interventions such that they can be applied in a variety of library/information settings. An example could be to use evaluation frameworks like RE-AIM to examine the implementation of library programs. Another example could be to use CFIR to identify barriers and facilitators for library programs, and then identify strategies to counteract barriers.

WHAT IS THE FUTURE OF IMPLEMENTATION SCIENCE?

Given the gaps in implementation science research, but with the importance with implementing effective interventions, more and more researchers from many health fields are now being trained in this area of research. As health sciences librarians and information specialists, health sciences librarians can embrace and become involved in this research and practice area with what health sciences librarians already do to ensure that the clinicians and patients we support receive the best possible care.

Let us start this conversation! Consider joining the Medical Library Association (MLA) translational science or the research caucuses to interact other librarians

interested in research and translational science. How else can you envision health sciences librarians' involvement in implementation science?

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Usage and preservation of Mizo traditional medicine by the people of Chungtlang Village, Mamit District, Mizoram

Esther Lalruatpuii; R.K. Ngurtinkhuma; Samuel Lalruatfela; K.V. Reddy

See end of article for authors' affiliations.

Diversity, flexibility, easy accessibility, broad continuing acceptance in developing countries and increasing popularity in developed countries, relative low cost, low levels of technological input, relative low side effects, and growing economic importance are some of the positive features of traditional medicine. In rural India, traditional medicine continues to be the only available form of care. Many communities continue to treat patients using their old methods, unaffected by contemporary medical advancements. Due to their accessibility, affordability, and ease of use, tribal tribes prefer to utilize and consult their own traditional healers. These are likewise thought to be highly effective and without any adverse effects. This paper aims to identify various traditional medicines used for treating illness and infirmities, by taking accounts from the residents of Chungtlang village, Mamit District, Mizoram. The objective here lies in discovering traditional knowledge of medicinal plants and their uses for various infirmities.

Keywords: Traditional; medicine; knowledge; infirmity; decoction; Mizo

INTRODUCTION

A significant portion of the populace of a number of developing nations rely on a variety of goods based on traditional knowledge (TK) as vital sources of income, food, and health care. Traditional knowledge might belong to an individual, a group, or a whole society. Both industrialized and developing nations use traditional medicine extensively in their healthcare systems. In actuality, the majority of the people living in underdeveloped nations receive their health care from traditional medications and therapy systems since they are readily available and reasonably priced. Traditional medicines are a result of human medical practice in many regions of the world and are a reflection of human wisdom from thousands of years ago.

The Mizos of the state of Mizoram in north-eastern India use a variety of plants to heal a variety of diseases. Their practices are particular, and local elders or traditional healers frequently carry them out. A variety of plants used in their traditional medicine have obtained scientific approval for their usefulness and toxicity research. To be found and used, however, many more are required.

What is Traditional Knowledge?

The term "traditional knowledge" describes the ideas, inventions, and customs of indigenous peoples. Traditional knowledge is frequently passed down orally from generation to generation. It is developed through experience gathered over many years and is tailored to the

local culture and environment. It typically belongs to everyone as a group and can be conveyed through myths, songs, folklore, proverbs, cultural values, beliefs, rituals, etc. It is also the origin of the traditional usage and management of lands, territories, and resources, including indigenous farming techniques that take care of the planet without depleting the resources. Indigenous peoples follow oral traditions, which have been practiced and passed down for millennia. These traditions include dances, paintings, sculptures, and other aesthetic manifestations [15].

Traditional knowledge is beneficial to contemporary business and agriculture as well as to individuals whose daily lives depend on it. The everyday routines and customs of indigenous peoples, as well as their in-depth knowledge of their ecosystems developed over many generations, serve as the foundation for traditional knowledge concerning land and species conservation, management, and restoration. It has the potential to significantly advance scientific, technical, and medical research, as demonstrated, among other things, by the pharmaceutical industry, and to solve the most critical global issues, including climate change, land management, and land conservation.

Traditional wisdom can also provide opportunities for ensuring food security for not just indigenous peoples but also for people everywhere. Numerous traditional methods of managing land and the environment have been shown to increase biodiversity locally and help keep

ecosystems healthy. An important approach to conserve and preserve indigenous cultures and identities, lower illiteracy and school dropout rates, improve learning, save the environment, and promote welfare is through educational practices that incorporate indigenous traditional knowledge and languages [16].

What is Traditional Medicine?

Traditional medicine is defined by the World Health Organisation as "health practices, approaches, knowledge, and beliefs incorporating plant, animal, and mineral based medicines, spiritual therapies, manual techniques, and exercises, applied separately or in combination to treat, diagnose, and prevent illnesses, or maintain well-being [13]."

Traditional medicine is the most ancient system of healthcare in existence, and it is used to treat and prevent both physical and mental ailments. In the past, different communities have created a number of practical healing techniques to treat a range of serious and life-threatening illnesses. Traditional medicine – also known as complementary and alternative medicine (CAM), ethnic medicine, or any other name – remains important in many nations today [18].

Characteristics of Traditional Medicine

The word "ethno medicine" refers to a traditional method of healing used by indigenous peoples that has to do with human health. It took hundreds of years of brave investigation and trial and error to learn which plants, animals, and minerals have therapeutic and palliative effects. This knowledge has been passed down from one generation to the next. Members of the community include the traditional herbalists. The prevalent illnesses of the populace are treated by the local healers in a home environment. Everyone is believed to be able to learn traditional medicine, and there are no formal educations or training requirements for using it.

In some families, nearly every member is familiar with one or more herbal medicines. The traditional healers are experts in specific fields of medicine. As a result, some doctors specialize in spiritual healing while others are experts in treating neurological illnesses, toxic stings, and setting broken bones. The effectiveness of herbal therapy is universally acknowledged by those who use it. Poor individuals in rural and urban areas rely on herbal cures since they are accessible to them. In fact, this is the sole accessible source of healthcare in isolated locations [11].

Objectives and Need of the Study

The main objective of the study is to identify, discuss, and document the use of traditional Mizo medicines by the Mizos. Since time immemorial Mizos, even with the absence of scientific and medical know-how, have developed their own way of dealing with various illnesses

and presumably offer treatment to those infirmities. Since this practice remained unpreserved and faces the threat of being vanished, preservation and proper documentation of these practices were the need of the hour.

In this contemporary advanced society, medical sciences offered humanity various antidotes to infirmities with advances in laboratory experimentation, with substantial negligence to traditional practices on medicines. Traditional medicines were deemed as superstitious and lack authenticity and reliability, however, one must not simply reject and neglect traditional medicinal knowledges because this knowledge is a product and result of centuries-old traditions.

Scope and Limitation of the Study

The area under which the study is undertaken is limited to the residents of Chungtlang Village, Mamit District, Mizoram where the population is limited to 501 in 2022, as per village record put forth by Village Council. Various respondents across the village were asked of their knowledge on traditional Mizo medicines which were familiar to them. Accordingly, 15 native medicinal plants were observed. However, since these traditional medicines were prescribed without scientific and empirical evidence, and ultimately vested upon oral narratives, they lack credibility and authenticity.

Methodology

The method utilized for collecting data involves the collection of secondary data from various sources like articles from recognized journals. Secondary data is collected by the author (s) observing the plants in the selected area under the guidance of the local people, with whom knowledge of these traditional medicines was procured.

DISCUSSION

This research comprises lists of various traditional medicinal plants, some of which were peculiar to Mizos. Different plants were identified by their local name (with narration from the respondents in Mizo), their common name (in English), their botanical name, as well as their family in the botanical term.

Table 1 Traditional Mizo Medicines and Their Names

Sl No.	Local Name (in Mizo)	Common Name (in English)	Botanical Name	Family
1.	Tawkte	Indian Night Shade	<i>Solanum violaceum</i> Ortega	Solanaceae (Potato family)
2.	Saisiak	White-Berry Bush	<i>Flueggea virosa</i>	Euphobiaceae

3.	Tlamsam	Siam weed	<i>Eupatorium odoratum</i>	Asteraceae
4.	Hlingsi	Chinese soapberry	<i>Sapindus mukorossi</i>	Sapindaceae
5.	Phuihnam	East Indian glory bower	<i>Clerodendrum colebrookianum</i>	Verbenaceae
6.	Lambak	Coinwort	<i>Centella asiatica</i>	Apiaceae (Carrot family)
7.	Kelba-an	Great plantain	<i>Plantago major</i>	Plantaginaceae
8.	Sap Thei	Passion fruit	<i>Passiflora edulis</i> Sims	Assifloraceae (Passion flower)
9.	Sawhthing	Ginger	<i>Zingiber officinale</i>	Zingiberaceae
10.	Aieng	Turmeric	<i>Curcuma longa</i>	Zingiberaceae
11.	Vailen Hlo	Sticky daisy	<i>Ageratum conyzoides</i>	Asteraceae
12.	Thingthupui	Pithraj Tree	<i>Aphanamixis polystachya</i>	Meliaceae (Neem family)
13.	Sekhupthur	Lushai Begonia	<i>Begonia lushaiensis</i>	Begoniaceae (Begonia family)
14.	Changkha	Bitter Gourd	<i>Momordica charantia</i>	Cucurbitaceae (Pumpkin) family
15.	Anhling	Spiral Nightshade	<i>Solanum spirale</i>	Solanaceae (Potato family)

Source: Websites

Preparation and Uses of Mizo Traditional Medicines

1. Tawkte (Indian Night Shade)

Its botanical name is *Solanum violaceum* Ortega from *Solanaceae* (Potato family). The fruit juice is used topically to treat herpes. The green fruit was crushed and thus applied to the treatment of herpes. Additionally, the fruit is administered directly on hurting wounds.

Figure 1 Leaves and fruits of *Solanum violaceum* Ortega in the wild.



2. Saisiak (White-Berry Bush)

Its botanical name is *Flueggea virosa* from *Euphobiaceae* family. The leaves are boiled and are used for taking baths for the treatment of Itching and Measles.

Figure 2 Leaves of *Flueggea virosa* in the wild.



3. Tlamsam (Siam Weed)

Its botanical name is *Eupatorium odoratum* from *Asteraceae* family. The leaf juice is used topically as an anti-septic. The juice is also applied externally to remove pinworm from the anus.

Figure 3 Leaves of *Eupatorium odoratum* in the wild.



4. Hlingsi (Chinese soapberry)

Its botanical name is *Sapindus mukorossi* from *Sapindaceae* family. Consuming of the fruit pulp is used for the treatment of Pile disorder. Fruit juice is applied externally in mumps. One or two fruits are soaked in water overnight and the water is then used as a gargle for cough and tonsillitis. The fruit is a substitute for soap for the Mizo people in ancient times.

Figure 4 Leaves of *Sapindus mukorossi* in the wild.



5. Phuihnam (East Indian glory bower)

Its botanical name is *Clerodendrum colebrookianum* from *Verbenaceae* family. Decoction of the leaves 2-3 times daily is given orally in the treatment of hypertension and also in diabetes. 5ml of the leaf juice is given orally and twice daily to treat colic in infants.

Figure 5 Leaves and flowers of *Clerodendrum colebrookianum* in the wild.



6. Lambak (Coinwort):

Its botanical name is *Centella asiatica* from *Apiaceae* (Carrot family). It is said that *Centella asiatica* is effective for the treatment of skin disorders. It is also popularly used as a memory stimulator. The leaves are boiled and the water is taken for the remedy of asthma and eye problems. Decoction of the dried leaves is also used for controlling hypertension. The leaf juice is also used as a remedy for blood purification.

Figure 6 Leaves of *Centella asiatica* in the wild.



7. Kelba-an (Green Plantain)

Its botanical name is *Plantago major* from *Plantaginaceae* family. The leaf juice is put in for earache and used locally for bee stings. To speed up the growth of new skin, the leaf decoction is applied directly to wounds and ulcers. It relieves toothaches and blisters on the gums. Decoction of the leaves is taken orally for the treatment of kidney and urinary problems, diabetes, malaria, and tuberculosis.

Figure 7 Leaves of *Plantago major* in the wild.



8. Sapthei (Passion fruit)

Its botanical name is *Passiflora edulis Sims* from *Assifloraceae* (Passion flower). This plant is used for treating jaundice. For medicine, the fruit is orally consumed. In order to control high blood pressure, the teas of the dried leaves were also consumed.

Figure 8 Leaves of *Passiflora edulis Sims* in the wild.



9. Sawhthing (Ginger)

Its botanical name is *Zingiber officinale* from *Zingiberaceae* family. Extract i.e. ginger oil is used in cough & bronchitis; rhizome is roasted & eaten against throat pain, applied as a condiment; flowering bunches are sold in local markets as a vegetable.

Figure 9 Shoot of *Zingiber officinale*.



10. Aieng (Turmeric)

Its botanical name is *Curcuma longa* from *Zingiberaceae* family. Mainly by crushing the rhizome, the plant is used for the treatment of ulcer, diarrhea, asthma, and heart diseases. For the treatment of intestinal colic, the young shoot of this plant is also taken orally. Crushed fresh rhizome is applied immediately to swelling, cuts, and sprains as well.

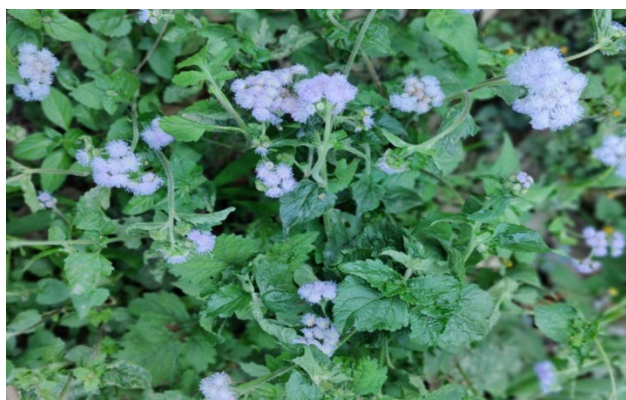
Figure 10 Dried *Curcuma longa* for further process.



11. Vailen Hlo (Sticky daisy)

Its botanical name is *Ageratum conyzoides* from *Asteraceae* family. The plant crushed is taken orally for the treatment of cholera. On itches caused by insects or by hypersensitivity, the leaf juice is applied.

Figure 11 Leaves and flowers of *Ageratum conyzoides* in the wild.



12. Thingthupui (Pithraj Tree)

Its botanical name is *Aphanamixis polystachya* from *Meliaceae* (Neem family). Decoction of the leaves is used for the treatment of dysentery, diarrhea, and hypertension.

Figure 12 Young leaves of *Aphanamixis polystachya* in the wild.



13. Sekhupthur (Lushai Begonia)

Its botanical name is *Begonia lushaiensis* from *Begoniaceae* (*Begonia* family). Decoction of the leaves and stems is taken orally for the treatment of dysentery, pile problem, diarrhoea, and malaria.

Figure 13 Young leaves of *Begonia lushaiensis* in the wild.



14. Changkha (Bitter Gourd)

Its botanical name is *Momordica charantia* from *Cucurbitaceae* (Pumpkin family). The leaf juice is taken orally for the treatment of jaundice, and hypertension. The leaf juice is also used as nasal drops. It is also used externally and internally for dog bites.

Figure 14 Leaves of *Momordica charantia* in the wild.



15. Anhling (Spiral Nightshade)

Its botanical name is *Solanum spirale* from *Solanaceae* (Potato family). Decoction of the leaves is used for the treatment of urinary retention and kidney stone. Berry juice is used for the treatment of boils, ringworms, and to remove water leeches from both people and animals' noses.

Figure 15 Leaves of *Solanum spirale* in the wild.



Documentation of Traditional Medicine Practices in Library

The scientists and urban population are still unaware of a significant amount of knowledge gathered by the tribal members and peasants about herbal medicine. Numerous plant species found in rural areas are on the edge of extinction and are listed as vulnerable. Rural people are being displaced from their natural habitats as a result of deforestation, urbanisation, and industrialization, and their very expertise, particularly with regard to herbal medicines, is slowly vanishing.

Today, interest is growing from a wide range of disciplines, including ecology, soil science, health, medicine, botany, water resource management, and many more. This crucial area of concern has just lately been acknowledged by the Library and Information Science (LIS) community. Although indigenous knowledge is available in library and archive collections, LIS professionals frequently fail to contextualise it. Librarians expertly catalogue, digitise, and display material so that the general public can access it in favour of intellectual freedom. However, some of the main goals of libraries and other information services, such as freedom of speech, intellectual freedom, the dissemination of knowledge, research and learning, access to information, and the preservation of cultural heritage, are at right angles to indigenous claims for greater protection of Indigenous Knowledge systems and cultural material [17]. There is a lot that LIS professionals can accomplish in the overall management of Indigenous Knowledge to make the documentation and distribution of Indigenous Knowledge a reality [2].

Mabawonku (2002) explains that information professionals have important responsibilities to play as development agents in discovering, gathering, interpreting, sharing, and conserving Indigenous Knowledge. Because of its stable position both within the community and within the government framework through which it is formed, the public library, for example, has been an ideal anchor partner in Indigenous Knowledge system related activities [4]. According to the International Federation of Library Association (2003), libraries can assist in gathering, preserving, and disseminating indigenous and local traditional knowledge as well as educating both non-indigenous and indigenous peoples about the value, contribution, and importance of indigenous knowledge [6].

CONCLUSION

Utilizing native flora for healing and implementing practices that improve community health is part of traditional medicine. The inclusion of information related to traditional knowledge in a common language and in an accessible manner has tremendously aided efforts to harness and develop it for use in the future. Libraries may be very helpful in keeping traditional medicines alive. Librarians may assemble traditional medical knowledge in both book and non-book formats using their experience in information management. Libraries should cooperate and collaborate closely with indigenous practitioners who are custodians of unpublished records and who are also within the purview of Library and Information Science of unwritten information in order to close the gap between the practices of information management by non-professionals who had focused primarily on unpublished information resources.

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Rosalind Farnam Dudden (1944-2023)

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See end of article for authors' affiliations.

Rosalind "Roz" Farnam Dudden, AHIP, FMLA, died September 27, 2023 [1] at Lutheran Hospice in Wheat Ridge, Colorado. Her daughter, Laura Dudden, was with her, as was the love of her family and many friends.

To summarize any life in just a few words is impossible. Fortunately, Roz's oral history [2] gives a full picture of her professional life, in her own words. Roz's reflection before the interview questions is also worth reading as it provides key insights on her approach to her life and work.

A lengthy list of Roz's accomplishments and many awards, including receipt in 2013 of the Medical Library Association's (MLA's) highest honor, the Marcia C. Noyes Award, does not completely convey how Roz was regarded by her colleagues in MLA and other professional organizations. Betsy Humphreys, former deputy director of the National Library of Medicine, noted "Roz was indeed an outstanding colleague, great innovator, and major contributor to our profession. Her positive attitude and good humor made her a pleasure to work with. She was always part of the solution – never part of the problem" [3].

Early MLA activity included her affiliation with the Hospital Libraries Section (HLS), becoming its treasurer in 1977. Her leadership as chair of the Hospital Library Standards and Practices Committee helped produce the first edition of the MLA Hospital Library Standards, published in 1984. In that same year, the section presented her with an award for her efforts which they called Resolution of a Debt of Gratitude. Roz chaired HLS for the 1987/1988 association year, developed and maintained the HLS website, and chaired the HLS Web Site Task Force from 1995 to 1998. While providing technology leadership to HLS, she also chaired the Consumer and Patient Health Information Section (CAPHIS) Web Site Task Force from 1995 to 1998.

As an early adopter and promoter of technology for hospital libraries, innovation and collaboration with colleagues were hallmarks of Roz's activities. In 1980, when she first heard of the concept of an automated integrated library system, she organized a committee to explore how a group of Denver hospital libraries might share such a system. In 1983, the group issued a request for a quote from several vendors and the University of Colorado Health Sciences Center (UCHSC) Denison Memorial Library. The UCHSC proposal was accepted,



and even though Roz was the driving force for this project, her institution would not fund her library's participation in the first group that joined the system.

Undaunted by the previous setback, and now serving as a librarian at a different organization, Roz established a new group of libraries to seek funding through an NIH/NLM Information Systems Grant in 1993. Members of the first group joined the funding effort to expand their existing programs, and \$219,014 was awarded to the seven-member collaborative. In 1995, Roz received the Frank Bradway Rogers Information Advancement Award in recognition of her leadership and technological achievements.

Roz directed two Denver hospital libraries: Mercy Medical Center (1971-1986) and National Jewish Health (1986 to retirement in 2011). Her contributions to colleagues in the Colorado Council of Medical Librarians (CCML) included resource sharing activities. She helped create the first union list of serials in 1977 and remained involved as either chair or a committee member for fifteen subsequent

editions. Roz inspired hospital librarians to get involved with Internet activities. She created Denver's first hospital website in 1995, taught HTML classes, and presented talks explaining the web's potential to many non-library groups.

In 1998, Roz was elected to the MLA Board of Directors. As a Board member and liaison to MLANET, she encouraged the development of technology to meet the needs of MLA members. During this time, Roz also worked tirelessly on the MLA Benchmarking Network initiative. In 2003, she received the MLA President's Award and attained MLA Fellowship status.

Among more than thirty publications, Roz authored the bestselling *Using Benchmarking, Needs Assessment, Quality Improvement, and Library Standards* in 2007, with support from a publication grant from the National Library of Medicine. Additionally, she co-edited the second edition of the *Medical Library Association Guide to Managing Health Care Libraries*, published in 2011. For this contribution she received the Eliot prize in 2012. Roz developed several courses, taught more than fifteen of them, and presented in over sixty invited and contributed sessions. Whenever she learned something new that could benefit other librarians, she developed an effective method of sharing that knowledge either through publications, presentations, or both.

Roz was an artist, working in pottery, watercolors, and Zentangles. She enjoyed music, theater, skiing, travel, and gardening. She volunteered at Denver's St. Francis Center for many years, providing services to individuals transitioning out of homelessness. Recent tributes, commenting on Roz's generosity and hospitality, included this story from Amy Six-Means, Clinical Research Librarian at Children's Health in Dallas, Texas. "I will always be humbled by Roz's generous spirit in sharing her home with me when I moved to Denver, not knowing me, but just because I was a librarian coming to work there. Then upon hearing me cough, after driving across the country from North Carolina, immediately took me to Urgent Care realizing I had bronchitis. Her welcoming spirit was the balm my soul needed as I started a new journey professionally and personally with that trip" [4].

Roz's life after her 2019 cancer diagnosis was as inspiring as her professional life. While undergoing treatments for the disease, she was determined to live the best life possible. She shared her journey on CaringBridge, a social network devoted to keeping families and loved ones connected during any type of health event. She spent time with family and friends and enjoyed her art and music. Roz continued her weekly COVID-era Zoom "cocktail hours" so that friends could share updates on their lives.

Most of all, Roz loved her family. Her husband, Jim Mills, her daughter, Laura Dudden, and her grandson, Julian Dudden, were her joy. Growing up in Connecticut as part

of a large family, her brothers and sisters remained an essential part of her life.

All who knew Roz, worked with her, took classes from her, or read her publications are richer for what she accomplished and shared with us. Those accomplishments, and her life, will inspire others for many years to come.

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Alvarez, BA. **The Library's Guide to Sexual and Reproductive Health Information**. Chicago: ALA Editions, 2023. 136 pgs. \$49.99. ISBN 978-0838938652.

With the overturning of *Roe v. Wade* in 2022, Americans had more uncertainty in their reproductive rights than they had in nearly fifty years. With increasing anxiety around health information, it's critical for libraries of all types to prepare adequately for the challenges patrons face when searching for information they may feel shame or embarrassment around. Barbara A. Alvarez's *The Library's Guide to Sexual and Reproductive Health Information* is a timely, thorough collection of the history of reproductive oppression and injustices and implementation plans for librarians in collections and outreach.

The text is divided into three main sections: Foundation, Education, and Implementation. In Foundation, Alvarez focuses on the fundamentals around sexual and reproductive health (SRH), on SRH as a library service, and on sexuality at large. In Education, Alvarez takes care to separate sexual health and reproductive health into equally essential but different areas of focus, as well

as a chapter dedicated to SRH for LGBTQIA+ folks. Finally, Alvarez concludes with implementation plans for libraries, primarily in public library spaces.

Alvarez adeptly takes these enormous concepts and covers them with inclusivity at the front of mind. Reproductive justice is a concept that is highlighted over the course of the text, calling attention to the fact "...that people of color and marginalized communities have long been denied the ability to exercise bodily autonomy and raise their families safely." (p. 6) Alvarez takes great care to illustrate how SRH is more than abortion or contraception, but "...it is a holistic lens of one's welfare and encompasses topics like housing, community safety, job opportunities, schools, (dis)ability, socioeconomic status, class, race, sexual orientations, and gender identity." (p. 6) There are very useful blurbs interspersed throughout the content to loop thoughts back toward libraries, covering topics like "Intersectionality at the Stacks," "Gender Inclusivity at the Public Library," and "SRH Resource Guide Ideas."

The audience in mind here is repeatedly public librarians, but there is room for all library types to implement an

outreach idea or a resource guide from the Implementation portion of the text. This would fit nicely in a collection that encompasses other health information service textbooks and diverse user outreach textbooks, like *Serving the Underserved* (ISBN 978-0-8389-3652-8) or *Promoting Individual and Community Health at the Library* (ISBN 978-0-8389-1627-8). Even if a reader feels well-versed in SRH, the Implementation portion offers exciting suggestions across all library roles, from collections to outreach to instruction, all while maintaining a lens of information professionals rather than healthcare workers.

In conclusion, *The Library's Guide to Sexual and Reproductive Health Information* provides a wealth of inclusive information regarding sexual and reproductive health. Though aimed at the public librarian audience, this would be equally valuable to librarians managing collections and outreach efforts in academic libraries, particularly in health sciences.

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Building Health Sciences Library Collections: A Handbook. Edited by Megan Inman and Marlena Rose, AHIP. Lanham, MD: Rowman & Littlefield, Medical Library Association; 2023. 156 p. \$120.00. ISBN 978-1-5381-7271-1 (Hardback). \$55.00. ISBN 978-1-5381-7272-8 (Paperback). \$52.00. ISBN 978-1-5381-7273-5 (eBook).

Referring to developing and managing health sciences library collections as an art would not be a hyperbolic statement. It is a detailed process and ongoing cycle in which librarians acquire skills and refine these skills through practice. *Building Health Sciences Library Collections: A Handbook* provides guidance to librarians, both new and experienced, working within a collections unit or as a solo librarian, on how to effectively build and maintain library collections. In addition to informing readers about the value of developing a strategy and employing a methodology, the editors and chapters' authors advise that collection development requires time, dedication, and collaboration with technical services employees, liaisons, administration, departments, and other relevant groups within an organization. At the end of each chapter, a list of suggested resources to acquire and a list of suggested resources to consult for further reading are provided. The type of resources within these sections can include books, journals, electronic information resources, bibliographies, or all four.

The first chapter of *Building Health Sciences Library Collections: A Handbook* is penned by Megan Inman who is one of the editors and does a great job of presenting an overview about collection development. Inman cites recent studies and surveys to provide evidence of the selection trends within

health sciences librarianship, e.g., electronic access being the overwhelming preferred format. These trends also influence libraries to reassess their purchasing model such as electing to pursue a subscription-based model rather than a perpetual access model since it would supply them with the latest editions to existing titles within the collection and new resources altogether.

Subsequent chapters focus on developing collections within the health sciences disciplines of medicine, nursing, and allied health, respectively. These chapters serve as practical guides for librarians as they can explore reputable resources or materials worth adding to their collections to support the needs of their users. Chapter 5 offers bibliographies for various specialties within the medicine discipline, clinical reasoning, doctoring, and evidence-based medicine. The materials include books, databases, and differential and point-of-care tools. This chapter also provides a bibliography to support different medical roles: students, residents, fellows, and clinicians. Very similar to Chapter 5, Chapter 6 highlights specific resources in various types and formats that serve the needs of nurses. This structure repeats in Chapter 7 as it provides an overview of online free resources of various formats for allied health professionals and offers bibliographies for eleven allied health professional roles.

In addition to offering guidance on how to develop subject specific collections, the book dedicates its Chapter 2 to developing diverse and inclusive collections with sound strategies and discusses the positive impact this effort can have on the patient experience and patients' trust in the medical profession. An inclusive collection that promotes DEI and the scholarship of researchers from diverse backgrounds or viewpoints, the book asserts, provides medical professionals an opportunity to learn more about the

experiences of underrepresented groups. Furthermore, the chapter also endorses building a collection of diverse materials to support protected groups such as licensing adaptive technologies for people living with visual impairment. The chapter also acknowledges the challenges libraries may face when attempting to grow diverse and inclusive collections due to lack of organizational buy-in and the amount of time and dedication that is required of a librarian to research and identify relevant resources.

A critical process in managing library collections is assessing the inventory and deaccessioning. Chapter 3 focuses on deaccessioning books in the health sciences library environment and finds it to be imperative in order to ensure currency in content, upkeep of the condition of physical books in the stacks, alignment with the academic curriculum, and fitting within the library space planning. The chapter advises libraries to use their collection development policies as roadmaps for the deselection process and inventory reports to capture the overall status of the collections to determine what needs to be weeded from their collections. The book also offers suggestions on how to repurpose the library space after deaccessioning and what to do with the deselected books, such as, launching a library book sale or donating to socially responsible and second-hand bookstores.

Building Health Sciences Library Collections: A Handbook is a very comprehensive handbook that covers the collection development process. Seasoned librarians can expect to find commonalities between what the editors and authors advise with their own library practices and serve as validation of their processes. They may also find there to be valuable nuggets of new information in reading Chapter 4 to be mindful about emerging topics when building a collection such as health humanities, graphic medicine, children's

books, and cookbooks; and to also consider supporting Open Educational Resources. New librarians will have a great appreciation for the perspectives and expertise offered by the editors and authors. They may also find it use-

ful to consult one of the materials referenced in chapter 3, "Managing a Collection Budget," of *Health Sciences Collection Management for the Twenty-First Century* by Susan K. Kendall (Rowman & Littlefield Publishers, 2018) to learn more about negotiating

strategies with publishers and vendors as a supplement to reading this book.

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