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COVID-19 and Innovation in Medical Library Services: A Scoping Review of Case Studies

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ABSTRACT

The services of medical libraries and information centers has changed due to the COVID-19 pandemic. This study aims to identify the innovative services of medical libraries and information centers during the COVID-19 pandemic. In this scoping review, PubMed, Web of Science (WOS), Scopus, ProQuest, Library, Information Science & Technology Abstracts (LISTA) databases were searched to identify case studies and case series. After screening the identified studies, 18 studies were selected. The results showed that the main users of medical libraries and information centers during COVID-19 were health care providers and recipients, researchers, organizational staff, and ordinary library users. Innovative services during the COVID-19 were also provided in these libraries, including distance education services, virtual information services, virtual guidelines, providing information resources, and evidence-based response to treatment teams. To provide these new services, medical libraries used traditional, semi-traditional, and modern information and communication technologies such as telephone, email, online library platforms, e-learning, and social networks. Medical libraries and information centers changed the way they provide services in the face of the COVID-19 crisis. Analyzing the services provided during this period can provide a model for policymakers, and medical librarians and information professionals to improve their services. The information presented here can be used to inform library services during future, similarly critical situations.

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Introduction

Reliable health information resources are among the most valuable assets available in all communities.¹ Access to and dissemination of health

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information improves self-care and health literacy. It also helps prevent disease and consciously deal with the disease and its problems.² At the macro level, it will lead to a healthy and aware society and ultimately sustainable development.

This is especially important in times of critical health conditions and pandemics. The COVID-19 pandemic which broke out in December 2019 posed a variety of threats to the world's public health.³ These include severe illness, stress, anxiety, depression, grief, and post-traumatic stress disorder.⁴ On the other hand, quarantine and restrictions on gathering in crowded places and communities disrupted people's normal lives.

The role of medical libraries includes assisting students, physicians, pharmacists, other healthcare providers and paramedical personnel, patients, and administrators in retrieving, disseminating, and providing quality health information, as well as conducting medical research and designing databases and relevant information centers. According to health professionals, medical librarians are essential staff who need to provide both on-site (physical) and remote (virtual) services.⁵

During the COVID-19 pandemic, medical libraries and information centers also faced problems due to social distancing requirements, infrastructure deficiencies, and a lack of plans for dealing with such crises. Limitations in access and, in some cases, the closure of physical spaces led medical librarians to design and implement initiatives and innovations in the context of existing communication technologies and remote service delivery to support research and public health, which elevated their role in providing up-to-date and reliable information to health workers and the general public.^{6,7}

Literature review

The biggest challenge of the COVID-19 pandemic for librarians was continuing to provide services as usual while adopting modern technologies. Wang emphasizes the need for libraries to create and facilitate access to information resources.⁸ This issue became doubly important given the vital role of medical libraries and information centers in the COVID-19 pandemic and the need for people to have access to credible and reliable information and to avoid inaccurate or distorted information.⁹

Various studies have been conducted on library services during the COVID-19 pandemics. Haugh found that medical library communication with users during COVID-19 was largely based on the classification of users inside the library or off-campus, as well as on the type of information needs, print or online. Libraries used the university email platform and the website to inform virtual users.¹⁰ Damasceno et al. found that librarians

played an important role in supporting medical and clinical teams in dealing with COVID-19 by identifying credible and relevant information.¹¹ Ansuategi et al. identified the challenges of open access to COVID-19 resources in Spanish medical libraries, as well as closure of centers.¹² Adigun et al. mentioned the role of Nigerian libraries in providing digital content, organizing and developing online programs, and providing reliable information about COVID-19.¹³ Howes et al. reported using virtual service technologies and models at Southern Illinois University Medical Library to improve internal communications and to provide services and resources to remote clients during the COVID-19 pandemic.¹⁴ Haugh also explored communication strategies for Yale University's Harvey Cushing/John Hay Whitney Medical Library users' access to services.¹⁰ The Central University of Florida Health Science Library was also affected by the closure of physical spaces during the COVID-19 pandemic, but as a digital library, it provided a variety of services and distance education.¹⁵

Several systematic reviews have been conducted on the impact of COVID-19 on the services of various libraries. Kostagiolas and Katsani reviewed the literature on the impact of the COVID-19 pandemic on public libraries and their management response during the pandemic and post-pandemic period.¹⁶ Kostagiolas and Katsani also mentioned the use of communication technologies in public libraries. Zareef and Ahmad examined the impact of the COVID-19 pandemic on university library services, specifically the role of academic libraries in deciding whether to accept digital and electronic services to support e-learning programs.¹⁷ This study indicated that university libraries provided off-campus access to digital resources. A systematic review by Ayeni et al. analyzed the services provided by libraries, the use of social networks and educational technologies, and the challenges facing libraries during the pandemic.¹⁸ Ayeni et al. also mentioned providing free access to electronic resources.

In general, the literature indicates on the one hand, it is necessary to provide access to quality, credible and reliable information about COVID-19, and on the other hand, libraries must change the way they provide services and information. Published studies focused more on academic, public, and non-medical library services in the COVID-19 pandemic. Therefore, due to the importance of medical libraries in making health information available to frontline health professionals and the community, a study to evaluate the services of medical libraries in the COVID-19 pandemic seemed warranted.

The present study aimed to investigate the services of libraries and medical information centers in the COVID-19 pandemic using the scoping review. The authors chose to do a scoping review because scoping reviews are suitable for identifying the key concepts of a topic, which was in line

with the purpose of the study. Systematic reviews require formal qualitative evaluation of studies, which was not one of the objectives of the study. This scoping review entailed a comprehensive search that included case reports.

This study seeks to answer these questions: What innovative services did medical libraries and information centers provide in the COVID-19 pandemic? What groups did they serve? And what communication technologies did they use?

Materials and methods

This scoping review was performed using Joanna Briggs' Manual for Scoping Reviews¹⁹ to determine the services of medical libraries in the COVID-19 pandemic.

Search strategy

Related keywords and their synonyms were determined by referring to MeSH, related texts, and the opinion of experts. Accordingly, the following keywords were used: Library services; Libraries, medical; Medical libraries; Health science libraries; Biomedical libraries; Hospital libraries; Dental libraries; Nursing libraries; Information centers; COVID-19; COVID19; 2019-nCoV Infection; 2019 nCoV Infection; Coronavirus disease-19; Coronavirus disease 19; SARS coronavirus 2 Infection; SARS-CoV-2 infection; SARS CoV 2 infection; SARS-CoV-2 infections; COVID-19 pandemics; COVID 19 pandemic.

According to the identified keywords, related studies were searched using the following strategy: ("Library Service*" OR "Medical librar*" OR "Health science librar*" OR "Biomedical Librar*" OR "Hospital Librar*" OR "dental librar*" OR "Nursing Librar*" OR "information center*") AND (COVID-19 OR COVID19 OR "2019-nCoV Infection" OR "2019 nCoV Infection" OR "Coronavirus Disease-19" OR "Coronavirus Disease 19" OR "SARS Coronavirus 2 Infection" OR "SARS-CoV-2 Infection" OR "SARS CoV 2 Infection" OR "SARS-CoV-2 Infections" OR "COVID-19 Pandemics" OR "COVID 19 Pandemic")

Search strategies for all databases are shown in [Appendix 1](#).

Databases

PubMed, Web of Science (WOS), Scopus, ProQuest, Library, and Information Science & Technology Abstracts (LISTA) were searched. The Journal of the European Association of Health Information and Libraries (JEAHIL) and the Medical Library Association (MLA) website, as well as

conference articles of the EAHIL International Conference and the IFLA International Conference, were also searched for gray literature. In addition, after identifying the final sources, their references were reviewed for further relevant studies.

Eligibility criteria

The inclusion criteria were: (1) case reports and case series studies; (2) Studies that examined the services of medical libraries (hospital libraries, health and treatment center libraries, medical university and school libraries) during the COVID-19 era; (3) Studies published from 2019 to the end of 2021; (4) Studies whose full text was accessible.

Study selection

A total of 859 records were retrieved by database, gray literature, and manual searches. After removal of duplicate records, records for 473 unique items remained. After screening the title/abstract based on the objectives of the study and eligibility criteria, 87 sources remained. In the next step, the full text of 87 articles were reviewed. At this stage, 69 studies were excluded due to non-compliance with study objectives and eligibility criteria, and 18 studies were selected to extract data. Two reviewers did the resource selection independently and disagreements were resolved by consensus.

Data extraction

The information extracted from each source included the name of the first author, year of publication, study country, study plan, study sample, type of services provided during the pandemic, service recipients, communication methods, and technologies used. Two reviewers did the data extraction independently and disagreements were resolved by consensus.

Data synthesis method

Data were combined and summarized by narrative method and presented in tabular form.

Results

As the PRISMA diagram (Figure 1) shows, the initial searches retrieved a total of 844 records. Manual searches identified 15 items not identified by the literature searches. After removing duplicates using Endnote X9, 473 sources remained. After screening the title/abstract based on the objectives

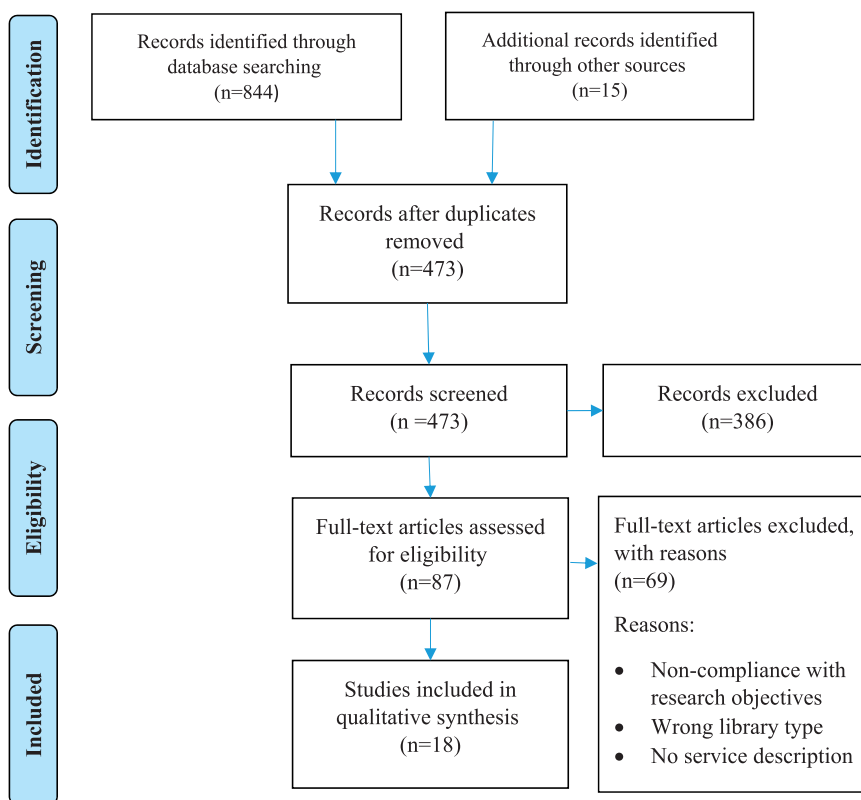


Figure 1. PRISMA flow diagram.

of the study and eligibility criteria, 87 sources remained. In the next step, the full text of 87 articles were reviewed. At this stage, 69 studies were excluded due to non-compliance with study objectives and eligibility criteria, and 18 studies were selected to extract data. The characteristics of the 18 selected studies are shown in [Table 1](#).

Findings were categorized into three groups, illustrated in the Tables below:

- Innovative services
- Service recipients
- The information and communication technologies used by medical libraries during the COVID-19 era ([Table 2](#)).

The services that medical libraries provided to their users in the COVID-19 pandemic were divided into 5 categories, which can be seen in [Table 3](#).

During the COVID-19 pandemic, medical libraries used a variety of information and communication technologies to provide their services. These have been divided into two categories: traditional and semi-traditional technologies, and modern technologies ([Table 4](#)).

Table 1. Selected Article characteristics.

Author(s)	Year of Pub.	Country	Goal(s)	Case(s) examined
Anderson, I. et al. ²⁰	2020	Sweden	Review of the library activities of the three main hospitals in Stockholm during the COVID-19 pandemic	Libraries of Stockholm's three main hospitals
Ansuategi E. et al. ¹²	2020	Spain	Review of a new model of collaboration conducted by the Donostialdea Integrated Health Organization Library in Spain during the COVID-19 pandemic	Library of Donostialdea Integrated Health Organisation
Cote, M. P., et al. ²¹	2020	USA	Investigate collaboration between several departments in the medical school, including the library, to establish a new online education support service for faculty members during the COVID-19 pandemic	Penn State Medical College
Creazzo, J. et al. ²²	2021	USA	Review of interlibrary loan services during the COVID-19 pandemic	Clinical medical librarians at a private hospital in Belo Horizonte
de Souza, A. et al. ¹¹	2020	Brazil	Review of clinical librarian services in COVID-19 pandemic	New York Cornell University Library
DeRosa, Antonio P. et al. ²³	2021	USA	Development of a specialized consumer health reference and health literacy training program by professional health librarians from an academic medical center	University of Florida Health Sciences Library
Gotschall, T. et al. ¹⁵	2021	USA	Review of University of Florida Health Sciences Library Services during the COVID-19 pandemic	Health science libraries
Harnegie, Mary Pat ²⁴	2021	USA	Examining the services of health science libraries during the COVID-19 pandemic	Harvey Cushing / John Hay Whitney Medical Library
Haugh, Dana M. ¹⁰	2021	USA	A Study of Harvey Cushing / John Hay Whitney Medical Library Methods for Communicating and Promoting Remote Sources and Services in Response to Coronavirus Disease	The University of Southern Illinois Medical Library
Howes, L. et al. ¹⁴	2021	USA	A review of the virtual service technologies and models used by the University of Southern Illinois Medical Library to improve internal communication and continue to provide services and resources to remote clients during the COVID-19	Estonia Brook University Health Sciences Library Preston Medical Library
Koos, J. A. et al. ²⁵	2021	USA	A Study of the Challenges, Solutions, and Practices of the Estonia Brook University Health Sciences Library during the COVID-19 pandemic	Four medical librarians
Lindsay, J. M. et al. ²⁶	2021	USA	A review of the services and experiences of librarians at the Preston Medical Library in the University of Tennessee during the COVID-19 pandemic	Ghent Health Knowledge Center Library
Mi, M., et al. ²⁷	2020	USA	A review of the experience of 4 medical librarians during the COVID-19 pandemic	Umea University Medical Library APH Library and Medical Knowledge Center services in Australia Las Vegas Health Sciences Library
Pauwels, N. S. et al. ²⁸	2021	Belgium	Explain the new roles created by the Ghent Health Knowledge Center library to provide assistance and advice to user groups during the COVID-19 pandemic	the Educational Library of the Medical University of Vienna
Sjögren, Karina ²⁹	2020	Sweden	Review of Umea University Medical Library Services in COVID-19 pandemic	
Velli, Gina ³⁰	2020	Australia	Review of APH Library and Medical Knowledge Center services in Australia on COVID-19 pandemic	
Weeks, A., et al. ³¹	2020	USA	Review of Las Vegas Health Sciences Library Services during the COVID-19 pandemic	
Zach, Luka et al. ³²	2020	Austria	Review of the restructuring of courses and lectures given by the Educational Library of the Medical University of Vienna during the COVID-19 pandemic	

Table 2. Recipient of medical library services in COVID-19.

Main group	Sub-group	Citation
Health service providers	Physicians and health care team	5,7,13,15,22,23,26,28
Recipients of health services	Patients and their families	5,26
researchers	Faculty members and students	4,5,7,13,17,22,24–27,29
Library users	Remote and face-to-face users	5,6,23–25,27,30–32
Employees of the organization	Employees	4,7,13,17,22–25,28,29

Table 3. Innovative services of medical libraries in COVID-19.

Main group	Sub-group	Citation
Distance learning services	<ul style="list-style-type: none"> • Holding training sessions, courses, and distance workshops • GoSkills online training • Production of educational videos 	4,5,7,13,22–25,28–30
Virtual information services	<ul style="list-style-type: none"> • Remote reference services • Interlibrary loan • Outreach librarian services • Share information in virtual groups • Provide a website classified according to specialties, for cooperation • SDI services • Online response and advice to users • Launching social channels and networks for entertainment purposes (such as introducing books and lunch or virtual breakfast) 	4–6,13,15,17,22–31
Prepare a virtual library service guide	<ul style="list-style-type: none"> • Holding virtual guided tours • Educate users to use library services electronically 	4–7,17,22,23,25,29
Providing information resources	<ul style="list-style-type: none"> • Provide multimedia content (including infographics and videos) • Provide full-text resources electronically • provide and Share timely accurate and quality information about coronavirus • Provide classified and quality information about coronavirus on the library website • Send printed books to users • Provide information in native language and English • Create a podcast club 	5–7,13,15,17,22,23,25,26,28,30,32
Responding to treatment teams in evidence-based medicine	<ul style="list-style-type: none"> • Teamwork for quick answers to clinical care questions with accurate and quality information during the covid-19 pandemic • Provide new online anatomy resources • Provide evidence-based medical summaries (by telephone) • Provide a Medical Wiki Project • Provide a virtual health library 	15,17,22,28

Table 4. Information-communication technologies used by medical libraries during the COVID-19 pandemic.

Information-communication technologies	Platform	Type of technology used	Citation
Traditional and semi-traditional information and communication technologies	–	<ul style="list-style-type: none"> • Email • Phone • SMS • Video chat • Digital boards • Rotating banners • Online whiteboard 	4–7,13,15,17,22–30,32
Modern information and communication technologies	Online library platforms	<ul style="list-style-type: none"> • ILLiad • DOCLINE • LibCal Springshare • LibAnswers • LibGuide • ConnectWise 	4–7,17,22,23,25,28,29
	Online medical platforms	<ul style="list-style-type: none"> • ClinicalKeyStudent • 3D4Medical • Video clinical sessions 	22,24,28
	Virtual training and teleconferencing platforms	<ul style="list-style-type: none"> • Zoom • Webex • Skype • Qualtrics • Microsoft Teams • Springshare Teams • Moodle • LMS • Canvas • Kaltura • Camtasia • Adobe Creative Cloud • Citrix Client • Poll Everywhere • Bongo 	4,5,7,13,22–25,28–30
	Social networking platforms	<ul style="list-style-type: none"> • Chatroom • Twitter • Google Hangout • Facebook • Instagram • Campus Daily Digest • WhatsApp 	4–7,13,15,23,25–27,29,30

Discussion

This study reviewed 18 case studies and series that examined the services of medical libraries and information centers during the COVID-19 pandemic. As stated earlier, the study aimed to identify innovative services provided by medical libraries and information centers, whom did they serve, and what communication technologies did they use?

Innovative services

One of the main trends in providing medical library services during the COVID-19 pandemic was the continued support for virtual and distance learning services. Many libraries provided virtual educational services,^{10,14,23,25–29,31} which highlights the importance of training users in

medical libraries. In addition, some libraries provided instruction in the form of videos and clips, and audio files, uploaded to the library's website and YouTube.^{14,28} Other articles also mentioned the provision of web-based educational services¹⁷ and virtual tutorials.¹⁸ Due to the importance of educational services of medical libraries, it is necessary to strengthen the appropriate infrastructure for providing educational services online. In this regard, the infrastructure of hardware, software, electronic content of courses, human resources to support the online education system, financial resources to create virtual education systems, as well as culture to use virtual education services should be considered. In the post-coronavirus era, services continue to be provided virtually to users who are not able to attend in-person training for any reason.

During the pandemic, medical librarians continued to provide access to electronic resources through the library website or via email.²⁰ Clinical medical librarians in a Brazilian library developed a virtual library to organize, index, and disseminate COVID-19 resources.¹¹ In the post-Coronavirus era, continuing to provide these virtual services to physicians and healthcare staff who may not have time to visit the library in person can improve medical library services and increase user satisfaction.

Hospital libraries provide evidence-based information services for physicians, nurses, and health care personnel who are always at the forefront of the fight against disease, and in the COVID-19 pandemic, their work became even more important. Among the services performed in this area in the studies reviewed included the creation and updating of a COVID-19 library,^{10,11} providing access to evidence-based medical summaries by telephone,¹¹ and subscribing to new online anatomy resources.²⁵ It seems that virtual information services in the field of evidence-based medicine and clinical librarianship need more attention. Further studies are also needed to review the services performed in this area during the COVID-19 pandemic by hospital libraries and clinical medical librarians.

Recipients of services

Medical libraries provide services to a wide range of users, including health care providers such as physicians and nurses, health care recipients such as patients, as well as researchers, students, and staff. Some of the case reports included in this scoping review examined the provision of services to all library users,^{10,15} and some of them considered services to specific groups. For example, Howes et al. discussed remote reference services by Southern Illinois University Medical Library to faculty, students, and staff.¹⁴ Zach et al.'s study also examined the educational services of the Vienna Medical University Library to students and staff.³² In this respect, the present study

is different from previous systematic reviews, because previous reviews have not examined the recipients of library services.¹⁶⁻¹⁸

Information and communication technologies

Moving to remote and virtual services required the adoption of necessary infrastructure and technologies. In this study, the technologies used by medical libraries were divided into two categories: traditional and semi-traditional technologies, and modern technologies.

In the category of traditional and semi-traditional technologies, libraries reported using technologies such as the telephone, email, SMS, online chat, online whiteboards, billboards, and digital banners to communicate with users.^{9-12,14,20,23-26,29,31} This can be attributed to the availability and prevalence of most of these technologies.

The second group, modern technologies, falls into four categories: online library platforms, online medical platforms, e-learning and teleconferencing platforms, and social networking platforms. Future studies may be warranted to identify the strengths, weaknesses, and efficiency of these technologies and to gauge user satisfaction with the technologies.

Limitations

One of the limitations of this study was that only case reports were examined. Therefore, it is necessary to consider other types of studies in future reviews. Another limitation was that the qualitative evaluation of the studies was not done.

Conclusion

Medical libraries, like other organizations and types of libraries, faced great challenges during the COVID-19 pandemic. Despite the health crisis and limitations that this pandemic created in all aspects of life, it also presented an opportunity to capitalize on librarian expertise to develop virtual and online services in medical libraries and information centers. In an effort to maintain continuity of service to all library user groups, medical libraries created innovative virtual services using a variety of information and communication technologies. Analysis of these services can inform the efforts of medical librarians, and information professionals to improve their services.

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Appendix 1. Search strategies for all databases

Database	Search strategy
PubMed	("Library Services"[mesh] OR "Library Service*" OR "Libraries, Medical"[mesh] OR "Medical librar*" OR "Health science librar*" OR "Biomedical Librar*" OR "Libraries, Hospital"[mesh] OR "Hospital Librar*" OR "Libraries, Dental"[mesh] OR "dental librar*" OR "Libraries, Nursing"[mesh] OR "Nursing Librar*" OR "Information Centers"[mesh] OR "information center*") AND (COVID-19[mesh] OR COVID-19 OR COVID19 OR "2019-nCoV Infection" OR "2019 nCoV Infection" OR "Coronavirus Disease-19" OR "Coronavirus Disease 19" OR SARS-CoV-2[mesh] OR "SARS Coronavirus 2 Infection" OR "SARS-CoV-2 Infection" OR "SARS CoV 2 Infection" OR "SARS-CoV-2 Infections" OR "COVID-19 Pandemics" OR "COVID 19 Pandemic")
WOS	TS=("Library Service*" OR "Medical librar*" OR "Health science librar*" OR "Biomedical Librar*" OR "Hospital Librar*" OR "dental librar*" OR "Nursing Librar*" OR "information center*") AND TS=(COVID-19 OR COVID19 OR "2019-nCoV Infection" OR "2019 nCoV Infection" OR "Coronavirus Disease-19" OR "Coronavirus Disease 19" OR "SARS Coronavirus 2 Infection" OR "SARS-CoV-2 Infection" OR "SARS CoV 2 Infection" OR "SARS-CoV-2 Infections" OR "COVID-19 Pandemics" OR "COVID 19 Pandemic")
Scopus	TITLE-ABS-KEY("Library Service*" OR "Medical librar*" OR "Health science librar*" OR "Biomedical Librar*" OR "Hospital Librar*" OR "dental librar*" OR "Nursing Librar*" OR "information center*") AND TITLE-ABS-KEY(COVID-19 OR COVID19 OR "2019-nCoV Infection" OR "2019 nCoV Infection" OR "Coronavirus Disease-19" OR "Coronavirus Disease 19" OR "SARS Coronavirus 2 Infection" OR "SARS-CoV-2 Infection" OR "SARS CoV 2 Infection" OR "SARS-CoV-2 Infections" OR "COVID-19 Pandemics" OR "COVID 19 Pandemic")
Proquest	(noft("Library Service" OR "library services" OR "Medical library" OR "medical libraries" OR "Health science library" OR "health science libraries" OR "Biomedical Library" OR "biomedical libraries" OR "Hospital Library" OR "hospital libraries" OR "dental library" OR "dental libraries" OR "Nursing Library" OR "nursing libraries" OR "information center" OR "information centers")) AND (noft(COVID-19 OR COVID19 OR "2019-nCoV Infection" OR "2019 nCoV Infection" OR "Coronavirus Disease-19" OR "coronavirus Disease 19" OR "SARS Coronavirus 2 Infection" OR "SARS-CoV-2 Infection" OR "SARS CoV 2 Infection" OR "SARS-CoV-2 Infections" OR "COVID-19 Pandemics" OR "COVID 19 Pandemic"))
LISTA (EBSCOhost)	(TX("Library Service*" OR "Medical librar*" OR "Health science librar*" OR "Biomedical Librar*" OR "Hospital Librar*" OR "dental librar*" OR "Nursing Librar*" OR "information center*")) AND (TX(COVID-19 OR COVID19 OR "2019-nCoV Infection" OR "2019 nCoV Infection" OR "Coronavirus Disease-19" OR "coronavirus Disease 19" OR "SARS Coronavirus 2 Infection" OR "SARS-CoV-2 Infection" OR "SARS CoV 2 Infection" OR "SARS-CoV-2 Infections" OR "COVID-19 Pandemics" OR "COVID 19 Pandemic"))