What role have academic libraries and librarians had in the fight against the COVID-19 pandemic?

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Abstract

Librarians working for scientific institutions have taken a leading role in the search and dissemination of information during the COVID-19 pandemic, providing a valuable service to society. Using literature analysis, a survey and interviews, it is possible to summarize their most significant contribution as follows: information specialists collaborating with medical databases have helped to the creation of specific catalogues containing all the literature related to COVID. The speed with which reviews are produced was increased in order to cope with the urgency of the requests for information. This was possible by using rapidly available sources such as preprints, with the results then compacted into *rapid reviews.* The clinical librarians have further made their contribution: on the one hand, prioritizing search requests on COVID-related topics and increasing the speed of the search with search banks and, on the other hand, being redeployed in clinical areas to assist medical teams.

Keywords: medical librarianship, clinical librarianship, COVID-19, Cochrane, World Health Organization

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EBM	evidence-based medicine
COVID	Coronavirus Disease 2019
WHO	World Health Organization
MERS	Middle East respiratory syndrome
SARS	severe acute respiratory syndrome
GIM	The Global Index Medicus
IRIS	Institutional Repository for Information Sharing
LSR	living systematic review
NLM	National Library of Medicine
ICTRP	The International Clinical Trials Research Portal
IRIS	Institutional Repository for Information Sharing
CCAs	Cochrane Clinical Answers
CDSR	Cochrane Database of Systematic Reviews
CDR	Cochrane Central Register of Controlled Trials
PPE	Personal Protective Equipment

1   Introduction

Nowadays, the Coronavirus Disease 2019 (COVID-19) severe acute respiratory syndrome (SARS) pandemic is all over the world's newspapers and televisions. However, this is not the first time that humans have been exposed to this family of viruses. In fact, according to the analysis performed by Tinelli on behalf of the '*Rivista Società Italiana di Medicina Generale'*, coronaviruses have generally been present all over the world and are currently responsible for about 10–15% of winter colds (Tinelli, 2020, S. 12). A first warning about the danger of these viruses presented itself nearly 20 years ago, more precisely in November 2002, when SARS[1] was observed for the first time in southern China. The disease spread on a large scale, reaching 32 countries and infecting 8,200 people. A subsequent coronavirus outbreak occurred 10 years later, with the Middle East respiratory syndrome coronavirus (MERS[2]-CoV) (Bundesamt für Gesundheit BAG, 2018).

Despite the experience with these two previous coronaviruses, nothing could have prepared the world for what would happen in 2019 and subsequent years. It seems to have been established by several sources that COVID (or SARS-CoV-2) was already present in China as of November 2019, predominantly in the populous city of Wuhan, the capital of the province of Hubei with more than 11 million inhabitants. At that time, there was a sharp increase in diseases affecting the lungs, but the presence of a new coronavirus was not imagined, and these infections were simply defined as '*abnormal pneumonias'* (Tinelli, 2020, S. 13) ; (IlPost, 2020).

To officially recognise the presence of a new virus, the world had to wait until January 9, 2020, the day on which the Chinese government recognised that the cases were the result of a virus belonging to the SARS-CoV family (Punzo, Bella, Riccardo, Pezzotti & D'Ancona, 2021).

Due to this delay, the ease with which one could move from one country to another and the high contagiousness of the virus, the contagion spread around the world like wildfire in a short time. The strict measures taken by China to keep the disease present only in the capital of Wuhan were ineffective: on March 11, 2020, the virus was present throughout the world, and the World Health Organization (WHO) officially declared that a

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[1] The acronym SARS (Severe acute respiratory syndrome) is used to describe the clinical picture of atypical pneumonia (Bundesamt für Gesundheit BAG 2018).

[2] MERS (Middle-East Respiratory Syndrome Coronavirus) is a coronavirus infection (Bundesamt für Gesundheit BAG 2019b).

pandemic[3] was underway (World health Organisation, 2020b). In the months following the outbreak, various speculations were made about the origins of this virus, ranging from animal transmission to hypotheses about military laboratories. According to Tinelli, the '*Bundesamt für Gesundheit*' and much of the scientific world, SARS-CoV-2 was probably transmitted to humans via the pangolin species of anteater after they were infected by bats (Tinelli, 2020, S. 12) ; (Bundesamt für Gesundheit BAG, 2021a).

This paper through literature analysis, interviews, and a survey will evaluate the contribution of librarians in these critical months. In fact, over the years the exchange of information and access to scientific databases has been transformed and optimized to such a degree that it has enabled information specialists in several academic institutions to take a leading role in the fight against the disease.

Thanks to the insights of Archibald Cochrane and David Sackett, the way in which the medical world uses information has been entirely revolutionized: treatments are prescribed using publications based on scientific evidence. This means using the state-of-the-art current information to make decisions about the care, diagnosis and treatment of individual patients (Tombesi, 2007). In order to allow the medical community to discover as much data as possible during the pandemic, all of the world's leading evidence-based medicine and medical databases have worked to provide the fastest and most complete coverage possible. Among these, standing out in importance and contribution is the '*Cochrane Project*', named in honour of the previously mentioned luminary, a database in which medical librarians and information experts perform reviews in which they summarise the most important aspects of various publications, ranging from journal articles to clinical trials, pre-prints and even letters (Cochrane, 2021c). The contribution of the '*World Health Organization*' is additionally worth mentioning, thanks to their '*Global research on coronavirus*' database, they have provided a centralised access point to all the latest information on the status of the pandemic and the most up-to-date techniques to treat patients (World health Organisation, 2021d)*.*

Librarians' contribution to this pandemic, however, has not been limited to analysing, summarising and making available evidence-based data. Fifty years ago, a clinical librarian named Getrude Lamb, following an experimental integration with a medical team, noticed how doctors needed information quickly and accurately. Thanks to this experiment, the new figure of '*embedded librarian'* (also known in the medical field as

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[3] A pandemic is when a specific infectious disease spreads in many countries or continents. It can put a large portion of the world's population at risk (Bundesamt für Gesundheit BAG 2019a).

'clinical librarian', *'outreach librarian'* or '*evidence specialist'*) was born in certain English-speaking countries. These librarians assist doctors in their daily activities, and they further participate in ward rounds and case conferences (Sargeant, Sally J E & Harrison, 2004).

Lastly, in addition to supporting the medical world, librarians have performed a valuable service to society during the pandemic. In fact, according to the '*Health information and libraries journal*', librarians have had the task of providing a large amount of '*public information*' – meaning information of interest to the population. This information can include, for example, hygiene regulations or data on the state of the pandemic (Yousuf Ali & Gatiti, 2020, 158–162).

2   Relevance of the topic

Libraries, as a social institution, are responsible for ensuring public health awareness and the provision of up-to-date information to clinicians and managers (Yousuf Ali & Gatiti, 2020, 158–162).

The collaboration among libraries, information specialists and the medical world has been ongoing for several years with satisfactory results (at least as far as some English-speaking countries are concerned). The roles that librarians assume can be defined as a fundamental component in the process of information research, exchange and analysis. Nowadays, the number of publications that doctors must consult has become onerous. In addition, accessing and searching for evidence in the numerous databases requires specific skills which librarians possess. Doctors, in contrast, do not possess such a dedicated skillset in these fields, as their training is more focused on aspects related to medicine and the treatment of patients. These problems have been exacerbated during the current COVID-19 pandemic: on the one hand, the amount of information has exponentially increased with the medical world's knowledge of the disease, and, on the other hand, doctors have even less time to search for information, given the high number of patients needing treatment. Therefore, this thesis explored all aspects relevant to the contribution of librarians in this new and rapidly changing situation. This, will allow for insight into where the profession can further evolve, allowing librarians to be more prepared for subsequent pandemics.

3   Delimitation of the topic

This paper aimed to answer the following question:

> *What role do academic libraries and librarians have in the fight against*
> *the COVID-19 pandemic?*

The integration of librarians in the medical world has a well-defined historical path and has been successful for several years, previously managing to deal with several coronavirus outbreaks, such as the SARS and MERS, and other diseases like Zika and Ebola. However, it must be acknowledged that there has not before been such an explosion of information and scientific evidence that has needed to be analysed. In addition, the large number of patients has frequently placed hospitals in critical and precarious working conditions, consequently affecting the work of librarians cooperating with medical teams.

Despite the problems that have emerged, the author of this thesis formulated the following hypothesis:

> *The concept of medical and clinical librarianship has evolved from its*
> *origins to the present day in such a way that during this pandemic, no*
> *particular new tasks have emerged.*

To answer the research question and the hypothesis, this paper presents four chapters.

The first chapter defines the roles and duties of librarians in the medical environment, namely, which tasks they have to perform within clinics, what contribution they have to provide to research and where they are most needed in a pandemic situation. In the following two chapters, their tasks are further explored by referring to practical examples. At the end of this rich overview of duties, a survey used to help determine whether or not clinical and medical librarians have incurred new tasks is presented.

More specifically, the chapters are listed below:

1. Librarians and their role in supporting research

This chapter outlines all of the ways in which librarians provide assistance to research, medical and scientific communities. Of particular mention is the role that librarians play within evidence-based medicine, the tasks that librarians must perform within clinics as embedded librarians and the contribution of librarians with regard to public information.

2. Which institutions are involved in the research and exchange of information in the fight against COVID?

In this chapter, the main databases involved in the exchange of evidence-based information about COVID-19 are briefly described and mentioned. Then, two organisations are presented in which the tasks of librarians have been particularly prominent. Firstly, is the '*Cochrane Project*', a database where teams of experts conduct comprehensive reviews of the COVID literature and present summaries of the results of the most relevant studies. Secondly, the role of the '*WHO library*' (World Health Organization library) and its central database '*Global research database*' is explored. To fully answer the above question, it was critical to completely deal with all aspects related to databases that deal with information exchange: operation, regulation, catalogues, where they operate and institutions that use them. In the medical environment, information must be reported to physicians quickly and accurately, and there is no room for error.

3. Clinical librarians and COVID patient care

Treating the large number of COVID patients in hospitals around the world has required incredible effort from doctors. In a first introductory part, a brief summary is provided of the possible courses of the disease and which treatment methods are needed. Through interviews and the survey, it was evaluated what contribution clinical librarians have had in this treatment process – thus, whether, due to the emergency, they had to take part in concrete practices in the care of patients, or whether their role was limited to providing information.

4. Evaluation of survey results

This final chapter takes stock of the collaboration between librarians and the medical world in this pandemic. For this purpose, the answers of the survey and the positions of the librarians who made themselves available for interviews were analysed. A crucial aspect related to the evaluation was to assess if the concept of medical and clinical librarianship needed further development in its tasks. For this reason, during the evaluation phase, attention was paid to whether the tasks that emerged were solely pandemic-related and were destined to disappear, or whether librarians would continue to perform them over time.

4   Working method

This research paper used three scientific methods to draw its conclusions regarding the contribution of librarians in the ongoing pandemic.

4.1   Qualitative analysis of documents

As the main methodology of the paper, a qualitative analysis of the publications regarding COVID and the contribution that librarians have provided to support the medical environment was chosen.

The general aim of qualitative content analysis is to evaluate texts and other communication material in detail in order to answer a specific research interest (Pfeiffer, 2020). In the case of this paper, the purpose was to precisely define the roles librarians have to assume in assisting the medical world. Included in this phase was the analysis of the main databases that make evidence-based information available. Their content was summarised in unique categories that were later formulated. For general information about the status of the pandemic and the protection measures in place, reference was made to the '*World Health Organization*', an organisation already presents in database analysis and the '*Bundesamt für Gesundheit*', the reference point for information on COVID-19 in Switzerland, the country in which this paper was written.

4.2   Qualitative interviews

Given the actuality of the topic, an analysis of the literature was not considered sufficient to clarify all the important aspects. For this reason, it was decided to interview professionals in the field in order to have an internal and current opinion about the course of events. The author of this paper conducted one interview for each of the three main topics. This was in order to have equal input throughout the thesis. Therefore, one person with the role of medical librarian (or information specialist), one clinical librarian and one person who could provide information about the database contribution were interviewed:

- Robin Featherstone – information specialist working for the *'Cochrane Project'* and co-author of the publication *'Ensuring quality as the basis of evidence synthesis. Leveraging information specialists' knowledge, skills, and expertise'* who contributed to part of the chapter on the skills needed to be a medical librarian.
- Tomas Allen – head librarian of the '*WHO library*', a professional with great experience in the field.

- Igor Brbre – clinical librarian professionally active in these years of the pandemic and working for the '*University Hospitals Sussex*'.

The interviews were in the form of a '*semi-structured interview*'. A semi-structured interview is a type of interview in which the person conducting the interview asks predetermined questions while the rest of the questions are not planned in advance but are posed in an unplanned manner. This type of interview provides the opportunity to spontaneously explore topics relevant to the subject matter being discussed (Pollock, 2020).

As a method of evaluation, it was decided to summarise the main contents of the interviews and to draw conclusions in addition to what was discovered during the literature analysis.

The summary of the three interviews can be found in the attachments at the end of the thesis.

4.3   Quantitative survey

The survey was chosen as the method for the quantitative research. This was because the type of questions lent itself particularly well to quantitative responses. For example, it was possible to establish which tasks were carried out most often or which databases were used most frequently by librarians.

The survey was realised using the software '*LimeSurvey*', and it consisted of 31 questions divided into five main categories:

1. Questions about the support for decision-making and public information,
2. questions about databases used for information research and reviews,
3. questions about the daily activities performed by clinical and medical librarians,
4. questions about the evolution of the concept of medical librarianship,
5. demographic questions.

The first two categories (1 and 2) of questions served as a solid contribution to the literature analysis section, while the hypothesis was answered in the two following categories (3 and 4). The last set of questions (5) presented the demographic aspects of the participants, thus providing an idea of the survey respondents.

To evaluate the survey, a statistical description of the results was made. The data obtained from the answers was generally proposed in percentage value. This description was then used to determine whether or not librarians had incurred any particular new duties.

The sample of people to whom the survey was submitted was important and reflected the results obtained. The author of this thesis attempted to have contributions from several nations around the world to ensure that responses were not limited to a single geographic area. This was because clinical and medical librarianship has not evolved in the same way in all nations of the world; therefore, it was important to exclude all countries where the profession has not developed to a sufficient degree to support the doctors in this pandemic. Thanks to the interview with clinical librarian '*Brbre Igor*', it was possible to define three main geographical areas in which medical and clinical librarians currently operate (Interview with Igor Brbre, 26.05.2021):

- North America,
- The United Kingdom (UK),
- Oceania.

Clinical and medical librarians actively communicate through mailing lists; therefore, to reach as many professionals as possible, after requesting consent, the survey was sent to the following three mailing lists:

- CANMEDLIB LIST: Mailing list for medical librarians from Canada,
- LIS-MEDICAL: Mailing lists for the UK Education and Research communities,
- ALIAHEALTH: Australian health librarianship issues e-list.

The survey was active from May 19 to June 7 2021, obtaining 112 unique responses.

In some chapters, responses are divided between clinical and medical librarians, with questions asked only to a portion of the survey participants. The count of medical librarians is 74 participants, while that of clinical librarians is 33 participants.

It should be noted that the number of librarians responding to the survey declined as the survey progressed; therefore, the number of responses obtained could vary depending on the question asked.

5   Librarians and their role in supporting research

In this introductory chapter, all the ways in which librarians assist the research and medical world are explored.

In order to describe the roles that librarians perform in the medical field, the chapter is structured in the following manner.

Firstly, a short historical recapitulation is made, contextualising the reasons why the profession evolved in that particular area. Then, the competencies needed to fulfil that specific role are presented, highlighting the importance of librarians and their specific skillset. Finally, a list of duties that define the work carried out follows. In order to contextualise these duties to the current pandemic, reference is made to the interviews; this to have up-to-date information based on what was discovered through the literature analysis. At the end of each sub-chapter, the results of the survey are described and evaluated to assess which activities were carried out most during the pandemic and other relevant aspects.

5.1   Identification of roles and duties

Cooper identifies in the publication '*Medical librarianship. looking toward 1970'* written by Thomas Keys, the reference librarian at the Mayo Clinic one of the profession's first milestones. Keys drew up an initial list containing the responsibilities and tasks to be performed by the health librarians. Those duties were divided into three main categories (Keys, 1939) ; (Cooper, 2013):

1. The purchase and preservation of books and journals with medical-related subjects.
2. The distribution of those books and journals. This was done through the traditional tasks of librarians, namely cataloguing, indexing and teaching research techniques to the costumers of the library.
3. The teaching to doctors by librarians on such subjects as '*The art of reading*', '*Selective reading*', '*Phases in the history of printing*', '*The care of books through the ages*' and '*The fundamentals of medical bibliography'*.

In his analysis, Keys additionally mentions his future expectations about the evolution of the profession:

> '*better cataloging, medical librarian educational textbooks, and a graduate school for medical librarians'* (Keys, 1939).

These considerations are interesting and show how the first pioneers in this field could not possibly imagine the evolution of the tasks of clinical and medical librarians from the beginning until today. Keys, in fact, had partially succeeded in identifying certain elements that are applied today (such as teaching physicians research practices), but contextualising them in an incorrect way. For example, the phases of the history of printing are not of interest to doctors; the teaching that is proposed to them is much more practical and aimed at improving research in databases.

The work of librarians in support of doctors has undergone many changes in the last century. It has evolved from simply providing books to becoming a truly integrated part of medical services. The roles that librarians play vary greatly depending on their specialty. The publication '*The COVID-19 (Coronavirus) pandemic: reflections on the roles of librarians and information professionals*' offers an excellent introduction to what are the main tasks of librarians in outreach and public information of science libraries during a pandemic.

In detail, three key roles are identified (Yousuf Ali & Gatiti, 2020):

1. *To promote public health awareness by creating and disseminating information relating to preventive measures.*
2. *To support research teams, researchers and faculty by providing information regarding the latest developments, research and literature.*
3. *To meet the core needs of regular library users.*

The purpose of this thesis was to contextualise the contribution of academic libraries in the fight against the COVID-19 pandemic, evaluating in a prominent way the support to aspects of health librarianship. Therefore, the point related to services to users (despite the fact that the access to the library is an important component of society) was excluded in favour of a more in-depth examination of the other two aspects.

Going into detail, referring to the publication *'Involving Clinical Librarians in Clinical Settings Skills Roles Advantages and Barriers*, the role *'support for research team, researchers and faculty by providing information regarding the latest developments, research and literature.'* previously defined by Yousuf can be further divided into two main categories (Zare-Farashbandi, E., Rahimi, Adibi & Zare-Farashbandi, 2019, S. 9)

1. Support for evidence-based medicine.
2. Assistance to medical teams in their daily activities (also known as '*medical information services*').

This allowed the author of this paper to identify three main ways in which librarians have provided assistance to scientific research, the medical world and society during the COVID-19 pandemic:

Support for evidence-based medicine	Assistance to medical teams in their daily activities	Public information
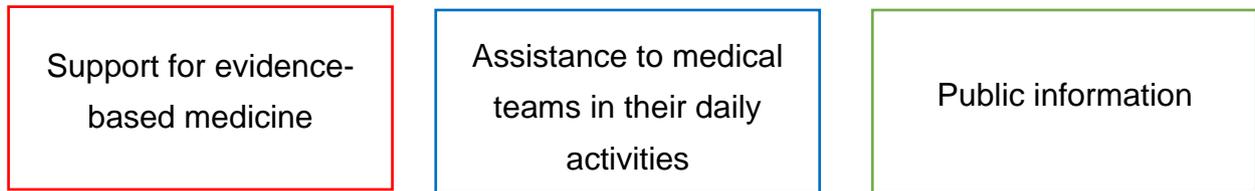
Nevertheless, it is important to contextualise that this list of duties is not mandatory: the medical world currently faces a devastating pandemic; thus, it is not out of the question that a medical librarian may have to perform tasks more related to the discipline of clinical librarianship or vice versa.

5.2   Support for evidence-based medicine

Evidence-based medicine has been a fundamental discovery that connects librarians, information specialists, medical personnel and, further, patients. Thanks to these principles and constant and rapid information and data review, patient care around the world has dramatically improved. This practice has received substantial contribution from the '*medical librarian'* or '*information specialist'* professionals who specialise in researching, analysing and summarising information.

Metzendorf and Featherstone describe the role of information specialists in their publication *'Ensuring quality as the basis of evidence synthesis. Leveraging information specialists' knowledge, skills, and expertise'* as follows:

> *Information specialists organize, disseminate and interpret information;*
> *they also preserve knowledge and ensure that it is discoverable in the*
> *future* (Metzendorf & Featherstone, 2018).

Over the years, the qualities and benefits of integrating an information specialist in research and analysis processes have not gone unnoticed. Information specialists no longer work solely in libraries but are increasingly being integrated into other types of organisations as information-related processes become essential to most businesses. Today, the world witnesses an increase in the production of information, frequently causing an overloading of data; therefore, librarians' skills should be further exploited to ensure quality and improve the efficiency of evidence synthesis (Metzendorf & Featherstone, 2018). To properly understand how this process started, it is worth it to take a step back 40 to

50 years – more precisely, to the historical period in which Archibald Cochrane and later David Sackett began to publish their important insights about evidence-based medicine. Thanks to these ideas, today, the medical world can take advantage of a large number of databases that provide evidence-based data, decreasing the treatment time of many patients, which has further proved to be of fundamental importance in the current COVID pandemic. This practice, as is explained later, is no longer the result of only the work experience of doctors but is based on the use and analysis of a large amount of evidence, analysis for which the skills of medical librarians and information specialists are required.

5.2.1 The origin

Numerous publications precisely and accurately describe the principles and ideologies on which evidence-based medicine was founded.

To write this brief historical overview, the author of the thesis decided to use as main references the '*Encliclopedia Treccani*' (considered one of the leading Italian ency-clopaedia), the '*Encyclopaedia Britannica*' (English counterpart of the Italian encyclo-paedia) and the publication '*The Philosophy of Evidence-based Medicine*' written by David Howick. This was not only to have a chronological representation of the changes in evidence-based medicine but also to be able to briefly mention the ideological trans-formations (Tombesi, 2007) ; (Howick, 2011) ; (Fitzpatrick, 2018).

With the development of technological knowledge and medical innovations in the 19th and 20th centuries, the way in which diseases were treated improved, and quality of life considerably increased. According to Howick, the increase in life expectancy between 1800 and 1900 was undoubtedly due to the capability to more suitably treat certain diseases as well as due to medical discoveries. In the century to come, although it was not possible to raise life expectancy further in a tangible way, the method of analysing medical data was changed in favour of scientific evidence (Howick, 2011).

In the first currents of thought related to evidence-based medicine, the importance and role of medical experts and professionals was emphasised. In particular, the difference between clinical experience (expert opinion that is not based explicitly on available empi-rical evidence) and acting on evidence was compared. The conclusion has been that clinical experience is only necessary when no other evidence is available and that it is not a valid method for drawing conclusions about the effectiveness of treatments on patients on a large scale (Howick, 2011).

An important evolution of the evidence-based medicine (additionally known in the medical field with the name of '*evidence-based health care*') concept can be traced to Archibald

Cochrane[4]: in 1972, he wrote a book named *'Effectiveness and Efficiency: Random Reflections on Health Services'* in which he noted that there was still no up-to-date review system on the effects of health care (Tombesi, 2007). Cochrane recognised the value that evidence-based medicine could bring to the medical environment. His approaches were well received by the general public, and he was able to convince medical professionals in particular. In the years of 1991 and 1992, evidence-based medicine started to be named and gain prominence in the scientific literature of the medical field, first in the '*American college of Physicians*' journal club[5] and later in the '*Journal of the American Medical Association*'[6]. This rapid development was additionally due to the increasing need to assess the reliability of a growing amount of research information being published and to apply new procedures (Fitzpatrick, 2018) ; (Tombesi, 2007).

However, the key year was 1993: the Cochrane Collaboration (named after the previously mentioned Scottish physician Archibald Cochrane), an international working group, was founded with the aim of disseminating systematic reviews of clinical studies on the effects of healthcare in order to provide the basis for evidence-based clinical practice (Tombesi, 2007).

A further step ahead was taken with the publication written by David Sackett[7] in 1996 for the *British Medical Journal* entitled '*Evidence-based Medicine: What it is and what it is not*' (Christensen, 2021). In an extract from the publication, evidence-based medicine is described as follows:

> *Evidence-based Medicine is the conscientious, explicit and judicious*
> *use of current best evidence in making decisions about the care of*
> *individual patients. The practice of Evidence-based Medicine means*
> *integrating individual clinical expertise with the best available external*
> *clinical evidence from systematic research* (Sackett, 1996, S. 71).

Not all comparative studies are seen as equal: a hierarchy based on the quality of the publications providing the evidence defines the '*best possible evidence*'. The most

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[4] Archibald Leman Cochrane was a Schottisch doctor. He is considered one of the founders of evidence-based medicine and an innovator in the field of epidemiology (Stavrou, Challoumas und Dimitrakakis 2014).

[5] The American College of Physicians (ACP) is a community of internal medicine specialists united by a comwithment to excellence. With 163,000 members worldwide the ACP is the largest medical specialty society in the world (American college of physicians 2021).

[6] The journal of the American Medical Association, is an international peer-reviewed general medical journal (Journal of the American Medical Association 2018).

[7] David Sackett was a professor of clinical epidemiology, a physician at the John Radcliffe Hospital, Oxford; and the director of the Centre for evidence-based medicine (British Medical Journal 2015, S. 26).

reliable kind of evidence is considered to be that generated by systematic reviews of randomised controlled trials, which minimise bias and allow causal interpretations of new interventions (Fitzpatrick, 2018) ; (Howick, 2011).

According to Christensen, this last evolution of evidence-based medicine has been based on three main pillars (Christensen, 2021):

1. Patient values and preferences.
2. The current state of clinical research and best evidence (also referred to as internal state of research).
3. Clinical expertise (also defined as external state of research).

5.2.2 Required skills

The reasons why the knowledge and skills of librarians are crucially important in the context of evidence-based medicine are accurately represented by the *Missouri Medicine Journal* in the publication '*Evidence-Based Medicine: Medical Librarians Providing Evidence at the Point of Care*': in order to be able to make an accurate and timely selection of current evidence-based publications, special skills are required. For example, the ability to search for the best evidence to support a clinical decision, the capacity to summarise articles in a short time and the knowledge of how to deal with complex interfaces. However, these skills (and in view of the current COVID pandemic, the time) are frequently not possessed by doctors, who are already sufficiently busy with their work in the treatment and care of patients. A crucial point lies in the few class hours available for bibliographic instruction during medical school. Medical librarians, in contrast, are adept at identifying appropriate resources and utilising different types of databases, thus making up for what doctors lack in this area: *time and research skills* (Yaeger & Betsy, 2014).

The benefits that librarians offer to scientific research and evidence-based medicine are additionally highlighted by the study of Featherstone and Metzendorf: in their article, they conclude that the presence of an information specialist performing systematic reviews improves reporting of search methods as well as overall quality assessments (Metzendorf & Featherstone, 2018). In the same direction, the study '*The new roles of medical librarians in medical research*' highlights the importance of integrating medical librarians into research teams. According to Safdari, nowadays, the presence of librarians and information specialists in medical research groups has become essential. With their support, it is possible to improve the quality and results of research.

An ideal way to further integrate librarians in this field is through the creation and planning of information programmes aimed at informing researchers of the role and support that librarians can offer in the medical field. In addition, through their presence at continuing education courses and through learning professional skills, librarians can showcase their skills to researchers and promote the research process in the medical sciences (Safdari & Ehtesham, 2018).

This ability to evaluate and search for information has been markedly more important during the COVID pandemic, which has seen not only an explosion in infections but also a sharp increase in medical publications and reports (Else, 2020): for doctors to simultaneously keep up with this flow of data and treat patients is simply impossible.

To give insight into the incredible amount of published evidence, Else, writing on behalf of the magazine '*Natur*e' performed a study which has provided certain indicative numbers.

In the article, it is reported, according to a count performed by the Dimensions database, that the articles published about COVID may have possibly exceeded the number of 200,000 at the beginning of December 2020 (Else, 2020).

Searching in the Dimensions[8] database, the number of listed articles jumped to 415,000 in May 2021 and 486,242 in June 2021 (Dimensions, 2021). This demonstrates, on the one hand, that this has been a topic involving much of the scientific world and, on the other hand, that without special skills and knowledge of research, it is impossible to identify which of these thousands of publications are the most relevant and effective. To compensate for this large presence of information, a number of medical databases have emerged today. These databases, with the constant contribution of medical librarians and information specialists, select the most important information and publications and then summarise the data in a uniform way.

5.2.3 Duties of a medical librarian during the COVID-19 pandemic

In his publication '*New activities and changing roles of health sciences librarians: a systematic review, 1990–2012*', Cooper identifies all of the roles that librarians can undertake in collaboration within the medical field. The following summarises and

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[8] Dimensions is a research information system that simplifies access to the most relevant information, analyzes academic and broader research findings. Developed in collaboration with more than 100 leading research organizations around the world, the system brings together for the first time more than 128 million publications, grants, policies, data, and metrics, allowing users to explore more than 4 billion connections between them (Digital Science 2021).

presents all the roles that were deemed appropriate for the context of medical librarianship and supporting the research community. The interviews conducted with Featherstone and Allen additionally served as a contribution to contextualising these tasks with the current pandemic and possibly defining new ones.

5.2.3.1 Librarians supporting work in systematic reviews

> *A systematic review is defined as 'a scientific tool which can be used to summarise, appraise and communicate the results and implications of otherwise unmanageable quantities of research'* (Beverley, Booth & Bath, 2003).

As previously stated, systematic reviews are a particularly appreciated support to the medical world and researchers. A systematic review contains a synthesis of the literature and relevant studies to answer a particular research question. To create a systematic review, researchers use an organised and previously defined method to locate, assemble and evaluate a body of literature on a particular topic using a specific set of criteria.

Medical librarians collaborate and actively work on teams involved in producing systematic reviews, increasingly assuming leading roles, appearing as co-authors of published reviews. A systematic review does not require the work of a single person: to avoid author bias, the minimum number of people involved is two. This number greatly varies depending on the topic on which the review is written. According to Featherstone's experience, the average number of people working on a systematic review on COVID-related topics has been six (Interview with Robin Featherstone, 13.05.2021).

Within these reviews, librarians can assume a variety of functions: according to Featherstone, the most suitable ones are to write '*search method sections'* and provide documentation about the sources to utilise. A professional with medical knowledge is, however, necessary. In fact, the medical background section, information about the importance of the topic and the urgency of the review are best suited for a clinician (Interview with Robin Featherstone, 13.05.2021).

These differentiations in roles can be further explored with the publication '*The role of the information specialist in the systematic review process: a health information case study*', which outlines 10 positions in which librarians actively support systematic reviews: project leader, project manager, literature searcher, reference manager, document supplier, critical appraiser, data extractor, data synthesiser, report writer, disseminator (Beverley et al., 2003).

The creation of a systematic review is a complex and long process which has to meet specific criteria. During the COVID pandemic, at least initially, there was no time to create such reviews; medical librarians therefore adapted and started to create *living systematic reviews*. These reviews require much more work and attention from information specialists and medical librarians: they must be searched and updated at regular intervals to see if additional evidence has emerged that needs to be added to update or possibly change the content of the review (Interview with Robin Featherstone, 13.05.2021). The definition provided by Featherstone is complemented by that offered by the British Medical Journal: The living systematic review (additionally known by its acronym 'LSR') is an emerging and current approach to updating systematic reviews. In this process, the review is updated at regular intervals (at least once a month) and generally published as an online-only systematic review (Mavergames & Elliott, 2021).

Allen, in his interview, further indicated heavy use of '*rapid reviews*': described in simple words, the rapid review process consists of taking a systematic review and making it as compact as possible (Interview with Tomas Allen, 21.05.2021).

Sources used

To work on a review (whether systematic, rapid or living), medical librarians and the teams they collaborate with for writing and editing use different types of evidence. Before the COVID-19 pandemic, it was common practice to use '*peer reviewed journal publications*'[9] as the primary source for gathering information (Interview with Robin Featherstone, 13.05.2021).

According to Featherstone's experience, during the pandemic, this type of publication (particularly in the first months) was entirely absent. This was because, on the one hand, there was a general lack of information about the new disease, and, on the other hand, the medical world needed the information immediately and did not have time to wait for peer-reviewed publications (Interview with Robin Featherstone, 13.05.2021).

For this reason, there has been a change in approach to information and data processing, using any form of evidence possible, including, for example, '*pre-prints*[10]'.

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[9] Peer review has been defined as a process of subjecting an author's scholarly work, research or ideas to the scrutiny of others who are experts in the same field. It functions to encourage authors to meet the accepted high standards of their discipline and to control the dissemination of research data to ensure that unwarranted claims, unacceptable interpretations or personal views are not published without prior expert review (Jacalyn, Tara und Khosrow Adeli 2014).

[10] Early extract from an article in a journal, periodical, conference proceedings, or even chapter in a volume, printed prior to publication of the overall work (Enciclopedia Treccani).

As an example of the motivation behind this change, before the pandemic, librarians searched for conditions and diseases that had existed for a long time and evaluated the effect, for example, in 10 years. In a pandemic, they immediately needed the information on the effects (Interview with Robin Featherstone, 13.05.2021).

The librarians did not limit themselves to using pre-prints: as Featherstone has assessed, there was a need to use all the available evidence. For this reason, medical librarians went as far as to use letters from the exchange of information between professionals (for example, further results from a specific trial or publication) as a form of information (Interview with Robin Featherstone, 13.05.2021).

This testimonial was evocative, as it demonstrated the shift from using peer-reviewed publications and a defined process of analysis for unpublished reports and letters, showing how medical librarians were able to adapt their methods and standards according to the needs of the medical world.

Standard in use

A fundamental aspect of systematic reviews is that they must be unambiguous, meaning that they follow a standard provision. In this way, on the one hand, consistency is maintained in the work, and, on the other hand, it is simpler for medical experts to extract information from it. During his interview, Featherstone mentioned the PRISMA and MECIR standards:

> *PRISMA is an evidence-based minimum set of items for reporting in systematic reviews and meta-analyses. PRISMA primarily focuses on the reporting of reviews evaluating the effects of interventions, but can also be used as a basis for reporting systematic reviews with objectives other than evaluating interventions (e.g. evaluating aetiology, prevalence, diagnosis or prognosis)* (PRISMA, 2021).

> *The Methodological Expectations of Cochrane Intervention Reviews (known as the MECIR Standards) are methodological standards to which all Cochrane Protocols, Reviews, and Updates are expected to adhere* (Cochrane, 2021j).

5.2.3.2 Guideline development

Another activity that emerged during the interview with information specialist Robin Featherstone was that of guideline writing. In her case, it was under contract with guide-line developers, a group affiliated with Canadian critical care. The guidelines were related

to how to manage transplantations to patients (Interview with Robin Featherstone, 13.05.2021).

During the last year there was an increase in request for guidelines because, as written by the publication '*The Changing Role of Medical Librarians in a COVID-19 World*', as a direct result of the coronavirus pandemic, the reading habits and skills required of medical personnel working in emergency rooms underwent a rapid and radical change.

> *At the onset of the pandemic, many nurses were required to update*
> *and increase their knowledge of the management of acutely ill patients,*
> *often on mechanical ventilation* (Zminda, 2021).

This translated into the creation of practice guidelines in the case of many information specialist, or the creation of an electronic reading list of references, as in the case of '*The Changing Role of Medical Librarians in a COVID-19 World*' (Zminda, 2021).

5.2.3.3 Support in database creation

During the COVID-19 pandemic, numerous databases were created to support internal work, the spread of current information and the production of reviews.

The creation of these databases occurred quickly and spontaneously in several organisations where medical librarians and information specialists actively worked. Featherstone has been involved in the creation of the '*Cochrane Study Register*', with tasks strictly related to research and import of information.

The creation of the databases is only the first step, and, to keep them up-to-date, it is necessary to search the various journals and websites that disseminate information on a daily basis (Interview with Robin Featherstone, 13.05.2021). This type of task has not occurred solely in the isolated case of Featherstone but in all large organisations involved in the sharing of medical information. Allen, a librarian working for the WHO, has participated in similar activities, helping to create the '*Global Research Database*' on behalf of the WHO library (Interview with Tomas Allen, 21.05.2021). How these databases work in detail will be explained in subsequent chapters.

5.2.3.4 5Prioritization of questions requiring systematic review

A final aspect highlighted by Featherstone is the increase in global interest in reviews. This increase in appeal has resulted in a direct rise in the number of scientific questions that have been proposed for a review.

In this sense, this is not an activity that medical librarians have not previously performed, but it is an activity that has gained importance and required more working hours. As with the production of reviews, the questions that are submitted are analysed and must meet criteria to be considered. Questions that are overly general cannot be reviewed.

Featherstone provided two practical examples of a question that could be answered by a systematic review and one that could not be answered (Interview with Robin Featherstone, 13.05.2021):

1. A bad question: *How is the pandemic going to change the world?*
2. A good question: *Is chloroquine or hydroxychloroquine useful in treating people with COVID-19 or in preventing infection in people who have been exposed to the virus?*

However, the work of information specialists is not limited to assessing whether or not the submitted question is valid. As Featherstone highlighted, at the beginning of the pandemic, the amount of information related to COVID-19 was limited. Thus, including in the case of a valid research question, information specialists have had to research whether sufficient evidence is currently available to conduct a review (Interview with Robin Featherstone, 13.05.2021).

5.2.4   Benefit for patient care and the medical environment

As the COVID-19 pandemic emerged (as with all new diseases), there were no proven treatment and care options that had statistical medical evidence. With the passing of time and the increase of publications of trials regarding the most effective treatments and cures, the first improvements in terms of recovery rates and disease course started to be noticed. From an analysis made by the '*International Journal of Antimicrobial Agents*', it has been possible to draw the following conclusions: since the publication of the first results of randomised controlled trials, it has been possible to see and evaluate what the most effective treatment options are to have a course of the disease that is as mild and fast as possible. In this analysis, Emani cites a trial '*RECOVERY*' that shows a 2.8% reduction in absolute mortality risk with dexamethasone, and the '*ACTT-1*' study showed that remdesivir treatment reduced recovery time by four days.

These examples are a brief excerpt of the study performed by Emani, but they demonstrate how, through the analysis of randomised trials and other studies or publications, it is possible to find the most effective treatment possible for a patient. All the variables of the case are to then be evaluated (age, pre-existing diseases, etc.) (Emani, V. R. et al., 2021).

5.2.5 Relevant information from the survey for the chapter *'Support for evidence-based medicine'*
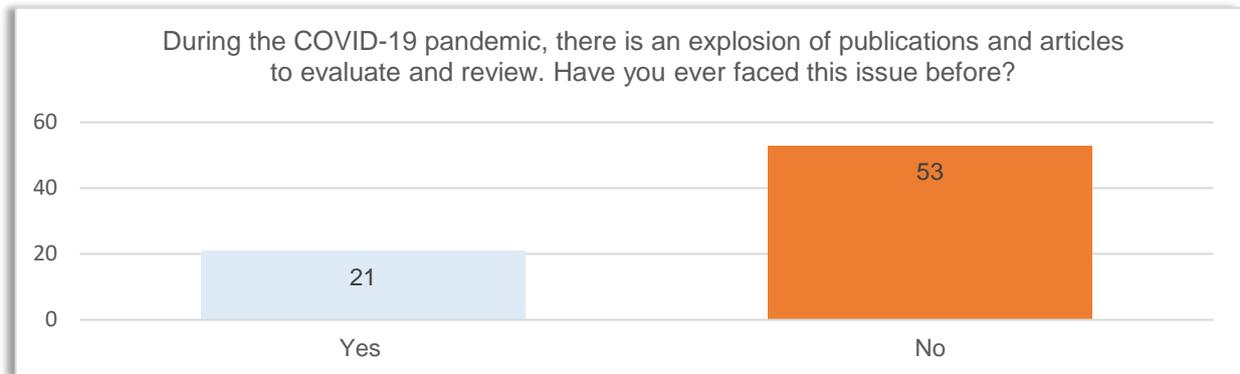
Figure 1: Information overload (Personini, 2021)

As can be seen from the graphic, the majority of medical librarians (72%) have never been confronted with such a large amount of evidence to analyse and such an enormous amount of documentation. This is despite the fact that, in recent times, there have been other disease outbreaks (for example SARS, MERS and ZIKA). This is due to the fact, as described by Allen, that during these previous pandemics, institutions went back to normal after a short time (indicatively three to six months) (Interview with Tomas Allen, 21.05.2021), while, for COVID-19, the situation has been ongoing for multiple years, causing a constant increase of evidence to be analysed and researched.
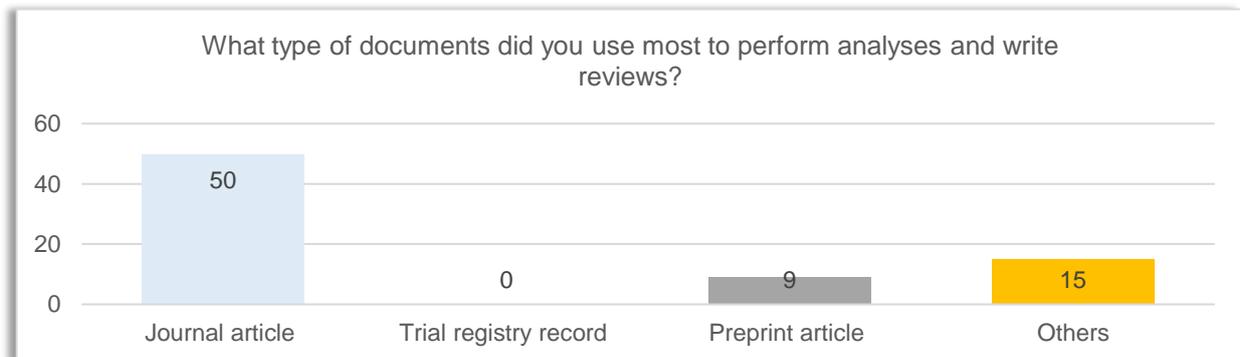
Figure 2: Sources used (Personini, 2021)

As determined during the interview with Featherstone, at the beginning of the pandemic, there was heavy use of pre-prints and documentation that had not yet been peer-reviewed. This was attributable to the need to quickly provide reviews and information to the medical community. One year after the start of the pandemic, a partial reversal of this trend could be seen: 68% of participants assessed that they used journal articles, 12% pre-print articles and 20% other document types as their main source of information.

Among this 20%, it was frequently reported that all three categories made available were used equally and not a specific one.

This change in trend may be attributed to the fact that one year after the start of the pandemic, a solid knowledge base regarding COVID-19 had been established, and although there have been continuous updates and findings, there is no longer such a strong need to use publications that have not been peer-reviewed. An interesting aspect that appeared in the comments was the COVID variants, for which there had not yet been such substantial evidence (due to their continuous evolution). In this case, it has been reported that pre-prints are still used: '*It depends. For the COVID-variants searches, I use the pre-print papers, for rapid reviews, I use journal articles*' (Personini, 2021).

5.3   Assistance to medical teams in their daily activities

Librarians do not support the medical world solely through deskwork, dealing with selecting and summarising the most important publications to answer a given research question. In fact, this information need of physicians is not only satisfied through the process of systematic reviews and guideline development: over the years, a much closer collaboration has emerged in which librarians follow doctors in their daily activities attempting to simplify their work and fulfil their information needs. These professionals are called '*clinical librarians'* or '*embedded librarians*'.

As with the previous chapters, a brief introduction is made that mentions the most important historical background regarding the emergence of clinical librarianship.

5.3.1 The origin

The role of clinical librarians is less acknowledged than the discovery of evidence-based medicine. For this reason, it does not currently have a place in the encyclopaedias used in the previous chapter. In order to briefly summarise the historical aspects, reference has therefore been made to medical library journals – in particular, the '*Journal of the Medical Library Association*' and the publication '*Clinical librarianship in the UK. Temporary trend or permanent profession? Part I: a review of the role of the clinical librarian*'.

The concept of clinical librarianship was introduced 50 years ago, more precisely in 1971 by Gertrude Lamb, who recognised the importance of quickly and accurately providing clinicians with background information about the patients they were taking care of (Sargeant, Sally J E & Harrison, 2004). Lamb's experience with doctors began while working with medical students and their supervisors during hospital rounds. Lamb, who at

the time was solely a '*classic medical librarianship instructor*' decided to get to the bottom of the teaching business by additionally going to work in close contact with doctors. In doing this, she discovered the great need for information from the various medical teams (Detlefsen, 2015, S. 121–122). Lamb created the first medical librarian programme at the University of Missouri-Kansas City School of Medicine in 1971 and has worked actively on behalf of Hartford Hospital and at other universities across America (Lipscomb, 2000, S. 393–396).

The university programme in its earliest form was described as follows:

> *A medical librarian is assigned to an inpatient service and attends*
> *rounds and conferences with the patient-care team. The clinical*
> *librarian searches current medical literature for answers to questions*
> *relating to patient care and management and provides the clinicians on*
> *her assigned hospital service with relevant articles. The review of the*
> *actual journal article for its appropriateness sets the clinical librarian*
> *apart from a library service that provides a bibliography or a list of*
> *citations in response to a question* (Lipscomb, 2000, S. 393–396).

This need for information on the part of clinicians led to a new form of cooperation, the objective of which was to establish an exchange of data between clinicians and information professionals in the clinical context of the patient to be treated. Given the satisfying results, this unique and experimental collaboration was repeated in the following years on the American continent. Programmes and collaborations in the United States have continued to expand and grow, gaining credibility and acceptance over time (Sargeant, Sally J E & Harrison, 2004).

In Europe, the counterpart to Lamb's revolutionary ideas was in the UK. The first experiments in cooperation between medical staff and information experts took place in the 1970s: the attempt was made at the '*Guys Hospital in London*'. In opposition to the success in the United States, these early projects and collaborations received minimal approval and success from medical practitioners, thus causing a temporary interruption. The reason for the failure was the low regard and trust that doctors reposed in librarians' skills. For a resurgence and re-evaluation of the concept, 20 years had to pass. The Cairns Library in Oxford began a project that involved the assignment of a librarian to a medical team, with the aim of improving its research capacity and improving the search for information in general. This time, the experiment had decidedly positive feedback. Then, eight years later, in 1998, thanks to these encouraging results, a study was conduc-

ted to evaluate the possibility of introducing clinical librarians in hospitals throughout the UK (Sargeant, Sally J E & Harrison, 2004).

5.3.2 Required skills

A recent analysis from 2019 performed on behalf of '*The Journal of Hospital Librarianship'* that assesses the aspects of involving clinical librarians in clinical settings was used to review the skills needed to work in the medical field as a clinical librarian.

In order to provide information quickly and efficiently to the medical teams with which they are affiliated, librarians must possess skills that go beyond the simple tasks an information specialist performs. Farashbandi, in reviewing a large body of literature, has identified three main areas of expertise (Zare-Farashbandi, E. et al., 2019, S. 5).

1. General skills,
2. professional skills,
3. medicine-related skills.

The general skills summarize all the basic competencies required of any newly trained librarian (the only exception is the requirement for excellent English knowledge) (Zare-Farashbandi, E. et al., 2019, S. 5). In fact, according to the analysis carried out by the journal '*Deutsches Ärtzeblatt'* over the last 130 years, the percentage of English-language journals in the American Index Medicus or Medline catalogue has risen from 35% to 89%, demonstrating that the tendency is to increasingly write in English.

An interesting aspect underlined by this analysis, however, is the emergence of journals in other scientific cultures in several countries, such as China and Brazil. This has therefore led to an increasing number of publications written in these respective national languages (Baethge, 2008). This aspect is explored in more detail later in the chapter about databases but was nevertheless a further source of problems since, initially, all the information available to the medical world about COVID was not in English but Chinese (Interview with Tomas Allen, 21.05.2021).

The professional competencies are the bibliothecal skills that must be possessed before beginning to work in the healthcare and medical environment. For example, a librarian must be able to accurately research and summarise information. The knowledge and principles by which information databases work are additionally necessary (Zare-Farashbandi, E. et al., 2019, S. 5).

The last branch of skills is what librarians learn by operating in the medical field over a period of years. These skills are needed to satisfy the demands received by doctors du-

ring the period librarians collaborate with them. These include an excellent knowledge of databases in the field of scientific evidence in medicine and how to search for this information quickly and efficiently (Zare-Farashbandi, E. et al., 2019, S. 5). These days, medical staff and other specialists affiliated with their teams require constant access to the most accurate and up-to-date information possible to answer '*basic questions*'. These questions are intended to gain general knowledge about clinical issues, and they are intended to make the best possible decision for patients. Evidence-based medicine, as seen in the previous chapter, brings many benefits to clinicians, but, in fact, it also provides such a high degree of documentation that it is impossible for a doctor to analyse it all. Moreover, clinicians frequently lack the knowledge to analyse or use these databases as quickly and effectively as possible. Clinical librarians therefore seek to quickly and efficiently understand the information needs of the medical teams with which they are affiliated (occasionally by being asked directly what to search for) and to help them access the information sources they need (Zare-Farashbandi, E. et al., 2019).

5.3.3 Duties of a clinical librarian during the COVID-19 pandemic

Embedded librarianship mainly focuses on fulfilling user needs and requirements. It brings the library and the librarian's own knowledge directly into the various working environments. These can be offices, laboratories or, as in the case of this paper, hospitals (Cooper, 2013). As confirmed by Brbre during his interview, this definition has been equally valid during the pandemic: Brbre stated that the clinical librarians during the pandemic would do everything they could do to assist the team as best as they could, adapting to their needs and attempting to support them in all possible ways (Interview with Igor Brbre, 26.05.2021).

The publications *'Clinical librarianship in the UK: temporary trend or permanent profession? Part I: a review of the role of the clinical librarian'* and *'Involving Clinical Librarians in Clinical Settings. Skills, Roles, Advantages and Barriers'* were used to define clinical librarian duties. As with the previous chapter interview with clinical librarian *'Igor Brbre'* and the results of the survey were used to contextualise how these tasks evolved during the COVID-19 pandemic (and whether any new tasks emerged).

5.3.3.1 Attendance at ward rounds and case conferences

The particularity of clinical librarianship is that the librarian spends part of his time outside the library, working closely with the team with which he is affiliated. Ward rounds are defined as medical teams travelling from one patient to another, stopping to discuss, consider and make decisions about the details and management of the method of care to be adop-

ted. Topics commonly addressed during those rounds include diagnosis, prognosis and treatment planning (Perversi et al., 2018). The general aim of a case conference is to achieve a common understanding within the medical team of the problems of the patient being treated. In this way, the choice of how to proceed and what specific actions to take can be jointly agreed upon (University of York, 2013). The purpose of this participation in practices historically approached by doctors is to directly and occasionally indirectly determine as precisely as possible what the information needs of physicians and other members of the medical team are. Once the librarian is aware of what information is needed to make decisions and diagnoses about patients, he conducts a search in the relevant databases and information sources, retrieves various documents and evidence and delivers the results to the medical team as quickly as possible (Zare-Farashbandi, E. et al., 2019).

Brbre confirmed the continuation of this important kind of activity during the months of the pandemic but with small differences due to COVID-19 restrictions: The librarians and the team participated once a week in what they called *'great rounds'* where the most difficult cases were discussed. In those meetings, the clinical staff who were on-site on the day met physically (five in person), other clinicians were in their offices or at home online. The meetings became a mix of physical and online presence (Interview with Igor Brbre, 26.05.2021). Of particular interest for this type of activity is another example provided by clinical librarian Igor Brbre: every Monday morning, he was required to attend a meeting called a '*handover meeting'* in which the clinical team that was in charge during the weekend handed over all the patients to the team arriving at the beginning of the new week. This involved going through the list of all the patients and briefly mentioning symptoms, important developments, important diagnostics, tests already done and those still to be done. The team had short handwritten notes for each patient, and they would go through them. Consequently, the team arriving for the week was updated on all patients. These meetings were normal practice before the pandemic and continued during the pandemic, clearly changing the caseload and the symptoms. The purpose of the clinical librarian was then to research any questions or issues that arose (Interview with Igor Brbre, 26.05.2021).

5.3.3.2 Information searching and evaluation

Participating in these case rounds is only the initial part of a clinical librarian's job and aims at directly or indirectly determining what the information needs of clinicians are. After this comes the most important and central part: the librarian has to search the most reliable, current and relevant databases and information sources, retrieving various docu-

ments and evidence and delivering the results as quickly and promptly as possible (Zare-Farashbandi, E. et al., 2019, S. 3).

The difference in these types of tasks compared to how they were before the pandemic has been that COVID-related questions receive the highest priority: for example, if clinical librarians receive a clinical question or a literature search question related to COVID-19, they have to give priority to answering that question. The goal is to attempt to give clinicians the answer as soon as possible. With regard to the type of questions received concerning COVID-19, Brbre identified three main areas in which he was asked for information (Interview with Igor Brbre, 26.05.2021):

1. Treating COVID,
2. therapies related to COVID,
3. Long COVID (also known as post COVID).

Sources used

Brbre confirmed Featherstone's statement about the sources used. In the early months of the pandemic, due to the lack of time and timing to get peer-reviewed articles in the major medical journals, pre-prints gained acceptance and usage. Of particular importance were the pre-print aggregators: MedArchive[11] and Europe PubMed central[12]. According to Brbre, they aggregate the contents of about 10 medical pre-print servers, making the work of clinical librarians much simpler: with one search, they could quickly scan several pre-print servers. This type of search is however penalised by the delay in publication. If the content is aggregated, there is a delay between when the article is published and when it is indexed. For the most important queries, it is therefore recommended to search in individual pre-print providers in order to discover the latest articles. This task was carried out particularly at the beginning of the pandemic. In addition to the strong initial use of pre-prints, Brbre used the most important medical journals, national guidelines, international guidelines and Royal College guidelines (Interview with Igor Brbre, 26.05.2021).

5.3.3.3 Current awareness of the medical team

Seeking out information to answer direct questions from the medical team is one aspect, however, Brbre stated that, in many cases, physicians' questions were anticipated, which

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[11] https://www.medrxiv.org/

[12] https://europepmc.org/

led to the creation of a current awareness system. The birth of this system can be divided into three main phases (Interview with Igor Brbre, 26.05.2021):

1. Initially, clinical librarians started by anticipating questions. If they found something special and important during the research, they would email it directly to the clinical team.
2. This task first evolved when they decided to stop sending daily information by individual e-mails and instead send a collection of resources once a week.
3. Finally, they stopped sending individual e-mails with collections and literature and started to place all possible useful information directly into the internal system they used to manage literature searches. In this way, doctors could choose and filter the information they received according to their interests and areas of specialisation.

5.3.3.4 Teaching techniques

As partially predicted by Keys, clinical librarians additionally provide training to medical staff in which they raise awareness about the use of the best evidence-based databases and the most effective methods of information retrieval (Zare-Farashbandi, E. et al., 2019, S. 9).

During the COVID pandemic, clinical librarians did their utmost to keep their activities unchanged and intact. This resulted in clinical librarians having their normal work plus all COVID-related tasks (which as previously mentioned had priority in any case). As far as teaching was concerned, the number of sessions offered before the pandemic was maintained. Obviously, due to the large amount of work, the number of participants decreased. As pointed out, this was because of the following:

> *All those who were able to work in the clinical areas were at some point reassigned to work in the clinical areas. There were not as many people applied to the teaching sessions as before. Everything that was not COVID-related became a bit slower* (Interview with Igor Brbre, 26.05.2021).

5.3.3.5 Speeding up information searches

The search for information by clinical librarians in order to respond to doctors' demands is crucial. As well as using reliable and appropriate sources, it must be carried out as quickly as possible. This is why, during the pandemic, clinical librarians in the UK created and used the **'National Search Bank'**[13].

Health Education England (the body responsible for providing medical education in England) set up a website of the bank, and any clinical librarian conducting COVID-related research was invited to enter their search strategy into the database. In this database, certain librarians act as peer reviewers of research, assessing which to publish and which need editing and improvement. The database has therefore been an appreciated and used tool by clinical librarians. In cases of new research questions, the first step is to go to the research bank and see if someone has previously researched a similar topic. In this way, it is possible to take blocks from other previously used searches and use them for the new search. As time went on, a special COVID-related search block was developed in order that librarians could only work on the clinical side of the question and then simply attach the COVID-related block to the search. This saved valuable time and improved the overall research results (Interview with Igor Brbre, 26.05.2021).

The Research Bank consists of four main categories (National Education England, 2021):

1. *Topics: authority-controlled subjects relevant to each search.*
2. *Details: the title of the search and its scope.*
3. *Strategies: links to search strings in Google or PubMed or to the search strategy used in the literature search if one has been included.*
4. *Completed: details of the date of the search, the organisation which completed it and a link to the finished search.*

Within a search, the database finds the following (National Education England, 2021):

- Which request is being searched for,
- in which databases the search is carried out (e.g. Medline, Embase, PubMed),
- the terms used for the search (e.g. Aerosol AND surface stability of HCoV-1 compared to SARS-CoV-1) and
- the date the search is conducted.

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[13] https://kfh.libraryservices.nhs.uk/COVID-19-coronavirus/for-lks-staff/literature-searches/

5.3.3.6 Use of the library

In this sub-category of tasks, a practical example is given of how librarians give access to the library building to allow physicians to use the literature and research for information. Brbre Igor, clinical librarian at Hospitals Sussex, provided the testimony. For this reason, the extract is included in the chapter on clinical librarians. However, this could additionally be an activity carried out by a medical librarian or any librarian working in a library affiliated with a hospital or nursing clinic.

The library in which Brbre worked remained open 24 hours a day seven days a week during the peak of the pandemic. To access the library during the times when the staff were not present, physicians and hospital personnel could use their access badges. In this way, it was possible to take and use the books at any time of the day, thus fully adapting to the needs of the hospital. It is noteworthy that, in order to avoid contagion to medical staff or library employees, library materials were additionally subject to quarantine and strict precautions. All materials returning from lending were quarantined for 72 hours, and, before being returned to the shelf, they were disinfected (Interview with Igor Brbre, 26.05.2021).

5.3.4 Benefits for patient care and the medical environment

Clinical librarianship benefits all aspects of the medical world and patient care. The table provided by the '*Journal of Hospital Librarianship'* can be summarised into the following three main categories:

- **Patient benefits:** Clinical librarianship brings several benefits to patient care, reducing the time patients are hospitalised or need treatment and reduces costs. This is because, as seen in their duties, they can provide timely information to physicians about the choice of treatment to be given, occasionally including anticipating doctors' questions, thereby reducing the time to treatment (Zare-Farashbandi, E. et al., 2019, S. 10).
- **Benefits to medical teams:** As far as medical teams are concerned, clinical librarianship offers the following benefits: it makes it simpler and faster to make decisions about which treatment to use for patients, and it increases access to evidence-based data. With the presence of a clinical librarian in the team, physicians can leave aside all aspects of information seeking (which became further important during the COVID-19 pandemic given the constant updates of information and possible treatments) and can then solely focus on practical measures of patient care (Zare-Farashbandi, E. et al., 2019, S. 10).

- **Benefits to education:** As presented in the task summary, clinical librarians continued their tasks related to educating and teaching medical staff during the pandemic. As a result of their support, there has been an overall improvement in the use of evidence by clinicians: information from more current and relevant sources is used, skill in using terms to search for information has improved, the quality of educational rounds has improved and there has been an overall improvement in the uniformity of the use of evidence (Zare-Farashbandi, E. et al., 2019, S. 10).

5.3.5 Relevant information from the survey for the chapter *'Assistance to medical teams in their daily activities'*
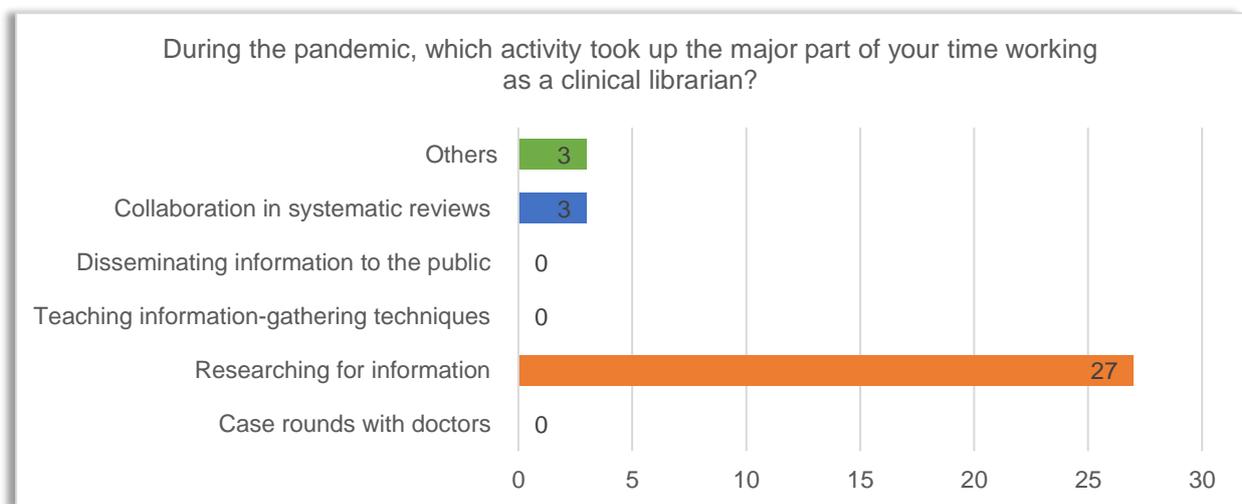
Figure 3: Activities performed by clinical librarians (Personini, 2021)

To assess which of the activities in the clinical librarians' responsibilities were predominant during the COVID pandemic, data from the survey was used. Of clinical librarians, 82% reported that they spent a majority of their time researching information to answer questions posed to them by physicians, and 9% collaborated in creating systematic reviews (a task more related to a medical librarian but which can be performed by clinical librarians as well). Another 9% performed other types of tasks, including tasks related to current team awareness such as: '*current awareness service*' ; '*I was doing weekly evidence updates for my teams early on in the pandemic so they had the* latest relevant research without having to go through hundreds/thousands of articles themselves' ; ' [...] during the pandemic I spent a good deal of time creating and disseminating current awareness bulletins aimed at senior managers, clinical leaders and clinicians, not the public' and 'monitoring new publications, news, official updates and pre-prints for current awareness bulletins for clinical colleagues' (Personini, 2021).

This higher percentage in the research activity was probably due to the initial lack of information on treatment methods about COVID-19. For this reason, requests from doctors on how to diagnose and treat patients took priority and required a considerable amount of time.

5.4   Public information

Finally, medical and clinical librarians are responsible for supporting politicians and their healthcare decisions by promoting and disseminating important information regarding protective measures, social distancing and other current issues of public concern in this pandemic. As mentioned in the previous chapter, the COVID-19 pandemic is a current issue, which is why information about how the disease spreads, is treated and cured was initially limited or possibly non-existent. This led, on the one hand, to a great effort on the part of information specialists and doctors to analyse and find the most effective methods of treatment and, on the other hand, to states taking preventive measures to avoid the spread. Among the most important measures taken by governments were the confinement of entire cities and measures to reduce social contact between people (Maltez, 2020, S. 36).

In order to ensure that these measures were understood and accepted by populations, a great deal of work needed to be done to make a large amount of information available, a role in which libraries have had a significant contribution.

In a week-long survey conducted in the UK in September 2020, more than half of the respondents (around 65% to be precise) had read false or misleading information. This occurred on a daily basis (Statista, 2020).

This small sample, however, accurately represents the value to the public of having a professional and credible service that disseminates information of public benefit – a service that librarians have all the skills to perform with precision and competence.

5.4.1 The origin

In contrast to evidence-based medicine and clinical librarianship, the role of libraries in the context of public information is not to be attributed to an iconic figure or an inventor but rather to an evolution of the concept and duties of the library itself.

In the article '*The Contribution of Libraries in Pandemic Crises: A Careful Look in COVID-19 Times*', the changes related to user engagement and tasks are accurately represent-

ted. This brief introduction summarises the main points in order to provide a brief historical context, as in the previous two chapters.

The role of libraries has undergone constant changes over the centuries. Librarians have proven to be professionals that are ready to accept new challenges, update themselves and remain up-to-date, adapting their functions to the needs of society. This role has undergone another abrupt change in the 21st century: traditionally, as stereotyped by most, the classic work of the librarian was limited to the physical management of the library and its holdings, namely the management of resources, the maintenance of the building and the provision of advice to customers (aspects additionally described in the introductory section by Keys). With the advent of the Internet, digital databases and an explosion of published information, librarians have further had to change their approach. This is because, unlike in the past, people generally have access to a wealth of data, but, without expert supervision, it is difficult to distinguish what is and is not reliable (Maltez, 2020).

According to the study provided by Maltez on Behalf of the '*Research Journal of Library and Information Science'*, librarians now fulfil an additional role, namely to publish information in a way that is understandable and simple to access for a wide audience (Maltez, 2020, S. 36).

5.4.2 Type of information to be disseminated

During a pandemic (in the case of this paper that of COVID-19), three main topics of information are identified on which targeted and detailed information should be provided (Yousuf Ali & Gatiti, 2020).

1. Importance of measures regarding social distance,
2. possible implementation of quarantine measures,
3. advice on how to search for information.

This information has been placed into context with decisions made on behalf of Switzerland, the country for which this paper was written.

5.4.2.1 Importance of measures regarding social distance

In order to reduce the transmission of the disease, all persons are requested to respect the social distance and to use a surgical mask (Yousuf Ali & Gatiti, 2020).

In Switzerland, a distance of two metres was initially imposed. This decision was then changed by the Federal Council on June 19, 2020, to a minimum distance of 1.5 metres (Bundesamt für Gesundheit BAG, 2020).

The face mask requirement in Switzerland was implemented on 19.06.2020, however, undergoing several modifications, as it had to be applied according to the location. As far as libraries were concerned, the requirement was imposed on October 28, 2020 (Bundesamt für Gesundheit BAG, 2020). The use of the surgical mask is still recognised as the ideal approach to reduce the number of infections. This is because one person can be positive for the virus without showing symptoms of the disease, becoming a possible source of contagion. Wearing a mask in crowded places where it is not possible to maintain distance helps to limit the spread of the disease (Bundesamt für Gesundheit BAG, 2021b).

5.4.2.2 Possible implementation of quarantine measures

Quarantine is one of the oldest and most effective means of controlling transmissible diseases (Yousuf Ali & Gatiti, 2020).

Quarantines have a long historical course and have generally had a duration of forty days. It was a period of segregation and observation to which people and objects considered capable of carrying with them the germs of exotic infectious diseases were originally subjected. It was applied to ships that came by sea (from which it took the name of maritime quarantine) (Gardenghi, 1953). Regarding COVID-19 in Switzerland, there is a requirement to quarantine all persons who have been in close contact with a person who has tested positive for the disease. In addition, quarantine is required for people who enter Switzerland after having stayed in a region with a high risk of infection (the list is further subject to constant changes) (Bundesamt für Gesundheit BAG, 2021c).

5.4.2.3 Advice on how to search for information

In the age of social media, misinformation spreads through all possible channels: for example, Facebook, Twitter, WhatsApp, Instagram, YouTube and other discussion forums. It is the duty of librarians to counter this phenomenon by only sharing information taken from reliable and trustworthy sources. Trusted information can be shared with library users through institutional and personal social media accounts, and platforms attempt to control rumours and fake news (Yousuf Ali & Gatiti, 2020).

The issue of misinformation is more topical than ever and should not be underestimated. The publication *'Information Typology in Coronavirus (COVID-19) Crisis; a Commentary'* written for the *'Archives of Academic Emergency Medicine'* identified 11 information typologies. The categories that were judged to be the most representative for the current pandemic are briefly mentioned and described. For the complete and comprehensive list,

please visit https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7075270/ (Ashrafi-rizi & Ka-zempour, 2020).

- **Valid information:** this is information that is based on the latest scientific evidence and is citable and applicable to others, for example, information on how to wash hands or the maximum time to use a mask before it loses its effectiveness (Ashrafi-rizi & Kazempour, 2020).

- **Comforting information:** this is information whose dissemination makes people more relaxed during this pandemic. This information provides hope and creates security, for example, information on the number of people who have recovered (Ashrafi-rizi & Kazempour, 2020).

- **Perplexing information:** during this pandemic, a large amount of information was released that the general public once had no access to (or had no interest in having access to). This type of scientific information produced to increase the knowledge of others (for example doctors or other highly trained people in a given scientific field) but sent to an unconnected public is called *'puzzling information'* because people do not have the knowledge to fully understand it. This information is primarily disseminated via so-called social networks (Ashrafi-rizi & Kazempour, 2020).

- **Misinformation:** this type of information is inaccurate, inexact and unreliable. In the coronavirus crisis, frequently, false or manipulated news was spread through social networks about the number of infected and dead people, increasing fear and anxiety among people. If this information is spread with the specific purpose of misinformmation, then it is called disinformation (Ashrafi-rizi & Kazempour, 2020).

- **Shocking information:** reading or hearing this kind of information makes the recipient dismayed, shocked and anxious. For example, in the early days of the coronavirus crisis, the web was full of information and videos illustrating the nature and dangerous behaviour of the virus. This information was incredible and terrifying to the general public (Ashrafi-rizi & Kazempour, 2020).

5.4.3 Practical example of public information

In this sub-chapter, a practical example of how librarians disseminated information of public benefit is presented. This testimonial was provided by Brbre Igor, clinical librarian at the University Hospitals Sussex.

> *The goal was to put resources together to spread information and to educate the public to a degree that they are able to tell what are trustworthy resources or if it's just misinformation or disinformation.*
> (Interview with Igor Brbre, 26.05.2021)

The library taken as an example provided three main resources to fulfil this task:

1. **COVID-19 key resources:** freely available evidence resources related to the pandemic as recommended by the librarians affiliated with the Brighton and Sussex university hospitals. These resources include information about the effects of Long COVID, a comprehensive list of databases offering evidence-based information, reference collections on COVID-19 and information on where to find reviews, clinical trials and the best pre-prints and journals to use during the pandemic (Brighton and Sussex University Hospitals, 2021a).

2. **COVID-19 vaccine information:** a website dedicated to offering information to the public about vaccines currently in use in the UK. On the website, general information about vaccines can be found as well as more detail on '*Pfizer and BioNTech's BNT162b2', 'University of Oxford & AstraZeneca vaccine (ChAdOx1 nCoV-19)', 'The Moderna and US National Institutes of Health vaccine (mRNA-1273 SARS-CoV-2)*', '*Janssen Vaccines & Prevention B.V. (Ad26.COV2.S)'* and other vaccines that are currently in phase III trials (Brighton and Sussex University Hospitals, 2021b).

3. A web page that contains all the information and publications from a COVID perspective that have been deemed useful for the current awareness of clinical librarians or anyone interested in using them (KnowledgeShare, 2021).

5.4.4 Benefit for the society

Maltez, in his study carried out on behalf of the '*Journal of Information science*', refers to Wang's publication '*Announcement information provided by United States' public libraries during the 2020 COVID-19*' in which important considerations are made regarding the role of libraries and public information in combating a pandemic. In detail, according to Wang and Lund, the community is willing to accept and embrace the measures imposed in a more compliant manner when it has access to more information about the pandemic and why these measures are being imposed. Unfortunately, due to the large number of communication channels and the presence of social media, it is frequently difficult for a person to distinguish between reliable information and incorrect and invalid information (Maltez, 2020) ; (Wang & Lund, 2020).

This is one of the reasons why information provided by a library is more reliable: before being released to the public, it is filtered and undergoes several revisions, making it a safe and reliable source of support (Maltez, 2020). In the study, one of the key words used to describe the benefits of public information for society is '*reducing panic and anxiety*':

> *[...]the availability of relevant information during pandemics helps in*
> *reducing anxiety among the public, which is important in the prevention*
> *of new infections* (Maltez, 2020, S. 36).

In conclusion, it can be said with certainty that, although less conspicuous than direct collaboration with physicians at hospitals or the creation of systematic reviews, the role of librarians in the public information task is of fundamental importance during a pandemic. In fact, it allows the public to have a constant and secure source of information, reducing, on the one hand, levels of anxiety and stress and, on the other hand, allowing an improved acceptance and understanding of preventive measures, thus indirectly reducing the number of new infections.

5.4.5   Relevant information from the survey for the chapter 'Public information'

During this pandemic, have you ever used the library website or other media to share information and raise public awareness

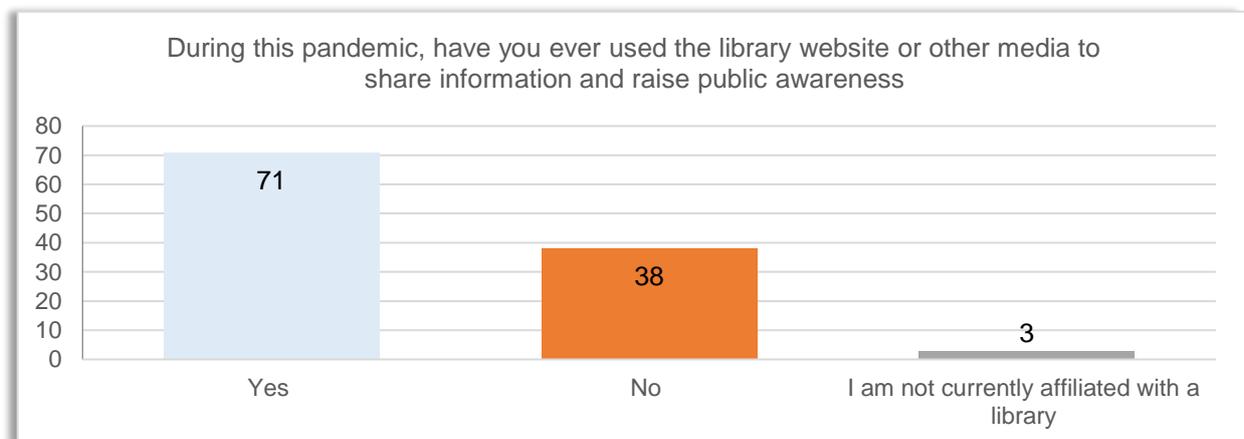|	Yes	No	I am not currently affiliated with a library
	71	38	3

Figure 4: Consideration of the public information task (Personini, 2021)

As can be seen from the survey results, the majority of clinical and medical librarians helped spread public information via library websites or other media. Only 34% of participants did not disseminate any information, and a low percentage of 3% are not currently affiliated with a library. Some libraries have used twitter to accomplish this task. Below are a few comments: *'Our primary mission is to support the clinicians and other staff at the hospital in which I work. Whilst we undertook some additional work on Twitter looking at misinformation in the pandemic, this was still principally aimed at our target audience.*

We did not have the staff time nor budget to extend our brief at a time in which we were already working beyond capacity to meet demand.'; 'We look after hospital staff not members of the public. Anything shared has been on Twitter' (Personini, 2021).

It is important to mention that librarians who did not disseminate any information did not do this because they felt it was unnecessary but because the service they provided was limited to hospitals and specialised staff. The following are comments made by survey participants regarding this aspect: '*We don't serve the public. We only deal with health professionals'; 'We are a hospital library. Our role is only to serve the staff of the health service and students on placement. We do not disseminate to the public'* (Personini, 2021).
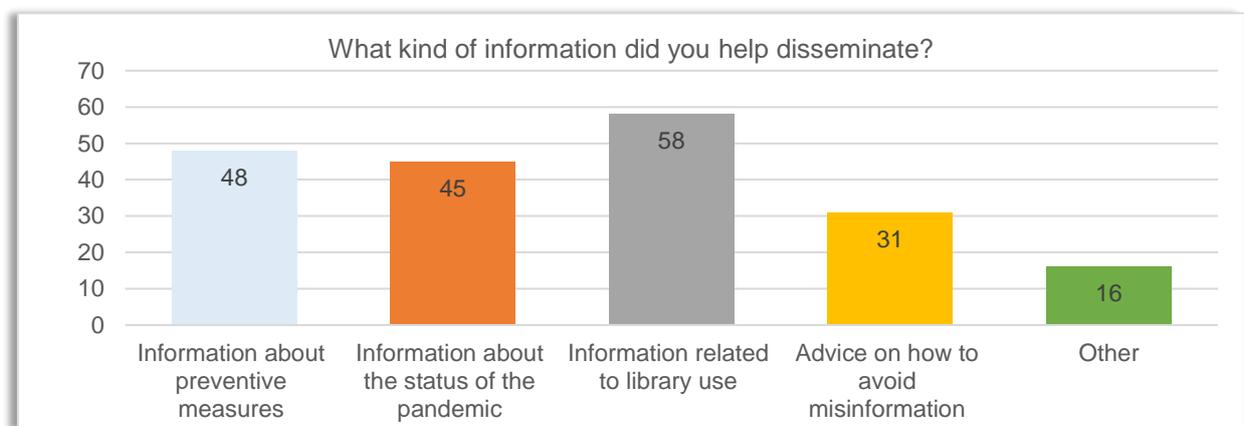

Figure 5: Categories of information disseminated (Personini, 2021)

Librarians disseminated information on all of the topics described in the previous chapter '*Duties of librarian regarding public information*', with a slight majority for information regarding library use (29%). This was followed by information on preventive measures to be taken to reduce the number of infections and information on the status of the pandemic. Of the librarians, 16% further provided advice on how to avoid misinformation.

Several librarians disseminated information not related to the categories predefined by the author of the survey, for example, '*information on telecommuting practices*'; '*how to live in this period of confinement*'; '*evidence to support patient care*' ; '*sources to access data on COVID in open access format*' and '*information on the current status of vaccines*' (Personini, 2021).

Another aspect that was assessed was whether the public took the libraries as a point of reference to ask questions about the evolution of the pandemic and COVID-19 related topics. A majority of libraries (84%) received very few questions, namely less than 10. This was followed by 10% who received more than 30 questions, 4% with 10–20 questions and 2% with 20–30 questions.
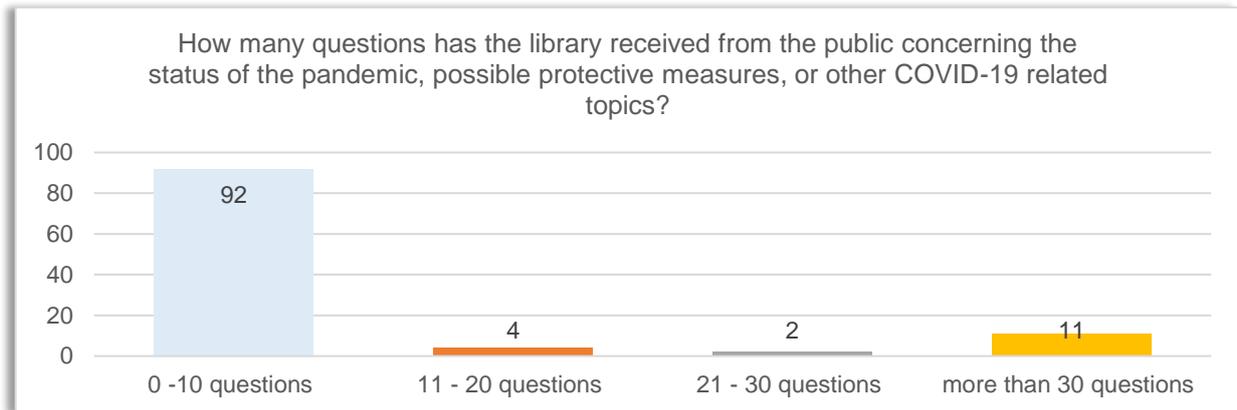
Figure 6: Number of questions received (Personini, 2021)

This low use of libraries as a reference point to carry out the questions occurred, according to the author of the thesis, for three reasons:

1. Libraries that have disseminated public information (as in the practical example brought by Brbre Igor) did it in a precise and detailed way. For this reason, all possible questions could already be clarified through the information made available.
2. Certain libraries, as described above, are not oriented to serve the public; consequently, due to not having access and use, the public does not ask them questions.
3. Within the various countries, several hotlines and ad hoc services were set up to answer people's questions about the pandemic, thus attracting a majority of the requests.
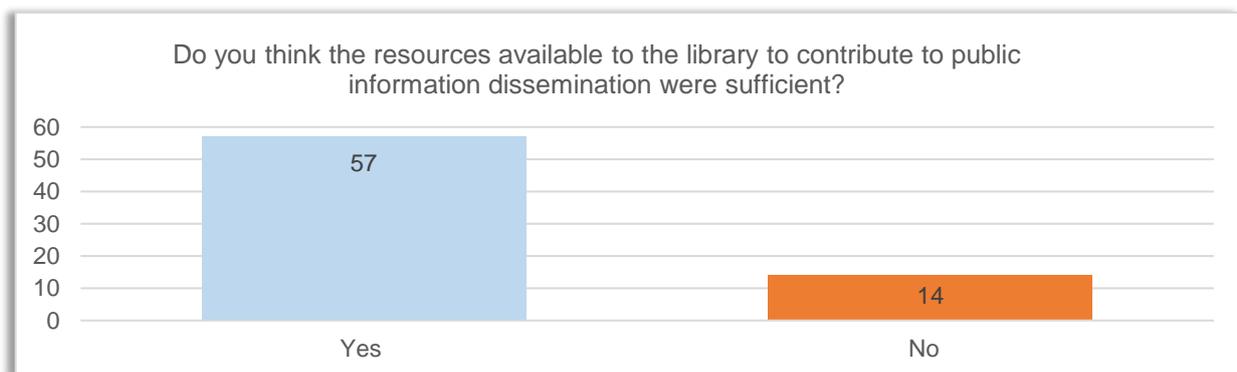
Figure 7: Assessment of available resources (Personini, 2021)

Finally, librarians who helped disseminate public information were asked whether or not they felt the library during the pandemic had the resources necessary to accomplish this task effectively. Of the respondents, 80% were satisfied with the resources available to them, while those who felt that the library did not have sufficient resources stated that the lack of media access to a wide audience and the lack of cooperation from the institution with which the library was affiliated were the reasons, for example, '*The library isn't*

allowed its own Twitter account, for example' and '*Lack of support from the org, or willing-ness to include library staff on committees which dealt with evidence*' (Personini, 2021).

5.5   Chapter conclusions

This chapter presents all the ways in which librarians assist the medical community, con-textualising their usual roles with the current COVID-19 pandemic. This disease has caused, at least in the first few months of the pandemic, significant changes to the way librarians work: in particular, the approach to medical evidence by medical librarians has changed to utilising different sources (from a marked use of peer-reviewed journal articles to pre-prints). In addition, with the increase in requests for review, it has been necessary to work more on the prioritization of questions. Clinical librarians have not been immune to change either: on the one hand, due to COVID restrictions, the way of conceiving ward rounds and the lessons that are provided to medical staff has changed, and, on the other hand, must of the work has been oriented towards research on the treatment of COVID-19 disease.
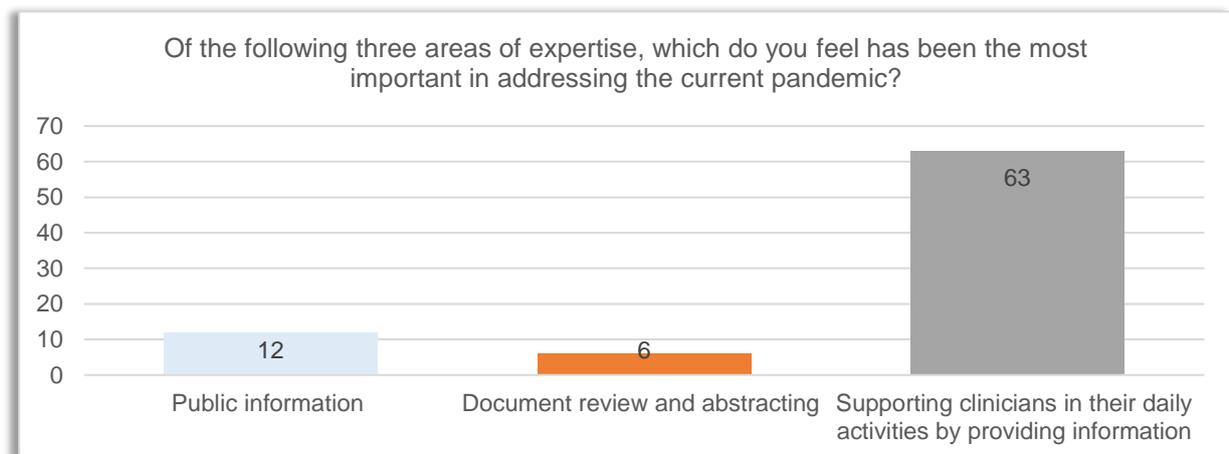
Figure 8: Assessment of the contribution of clinical and medical librarians (Personini, 2021)

Librarians who participated in the survey were then asked which of the three areas pre-sented above they felt was most important in this pandemic:

As can be seen from the chart, there was an overwhelming majority for the duty of '*provi-ding information to clinicians*', with 78% of the preferences. This was followed by '*disse-minating public information'* with 15% and '*document review and abstracting'* with 7% of preferences. From this chart, it is clear that searching medical evidence catalogues and databases for information to provide to physicians is a central and fundamental part of the work during a pandemic.

To conclude the chapter, hints to more ideally respond during a possible future pandemic are presented. These were provided by the clinical librarian '*Igor Brbre*' but apply to all the categories presented.

> *At the end of the public health emergency, there will be a need to*
> *update the current protocols in place to respond to pandemics.*
> *Similarly to medical areas, medical and clinical librarians have*
> *protocols with guidelines to address pandemics. The library community*
> *will then need to work on these protocols and guidelines in order to*
> *respond to future pandemics as quickly as possible. This is to have*
> *improved cooperation among librarians, avoid unnecessary strain and*
> *more ideally coordinate work* (Interview with Igor Brbre, 26.05.2021).

6 Which institutions are involved in the research and exchange of information in the fight against COVID?

As mentioned in the previous chapter, over the years and thanks to the insights of Cochrane and Sackett, evidence-based medicine has gained acceptance within the medical world. This has led to the creation of several databases that provide journal articles, clinical trials and other sources of information based on medical effectiveness. The purpose of these databases is to aggregate, publish and index the content of various publications and journal articles, with the aim of making them available to the medical world or anyone interested in them.

In addition to medical and information technology personnel, these databases feature collaborations with information specialists and medical librarians from all over the world, providing an example of a possible way to integrate this profession outside of the traditional library.

The use of these resources during the COVID-19 pandemic became even more important, as there was a constant need for reliable information about the most effective possible treatment for patients most severely affected by the disease.

The following chapter firstly briefly mentions several of the most important databases in the exchange of information related to medical data (and therefore to the pandemic), and a description follows in a more detailed way of two databases chosen by the author.

There are many reliable databases; thus, unfortunately, it is not possible to describe and mention all of them. '*The Universitätsbibliothek Mainz*' website[14] and the previously mentioned '*Brighton and Sussex University Hospitals library*'[15] offer a comprehensive list of the main databases and key resources that can be used to find current and trustworthy information for the COVID-19 pandemic (Universitätsbibliothek Mainz, 2021) ; (Brighton and Sussex University Hospitals, 2021a).

From this list, the author chose to analyse the following:

The Cochrane Collaboration

The Cochrane Library can be found in practically all websites that recommend the best databases to utilise for evidence-based information.

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[14] https://www.ub.uni-mainz.de/de/evidenzbasierte-informationen-zum-coronavirus

[15] https://www.bsuh.nhs.uk/library/accessing-information/COVID-19-key-resources/

Cochrane expert teams composed of information specialists and other professionals carry out comprehensive reviews of the literature about COVID-19 and present summaries of the results of the best studies. This allows researchers and clinicians to have a quick answer to any research question (assuming the question was reviewed by the Cochrane team. As is seen in the dedicated chapter, there is a process that defines the priority with which questions should be answered).

The Cochrane collaboration is an ideal example of how information specialists and medical librarians can be integrated at a practical level in the medical context. Their contribution in creating Cochrane reviews is important and internally recognised.

The St. Petersburg College website defines the Cochrane collaboration as follows:

> *The Cochrane Library contains high-quality, independent evidence to inform healthcare decision-making. It includes reliable evidence from Cochrane and other systematic reviews, clinical trials and more. Cochrane reviews bring you the combined results of the world's best medical research studies, and are recognised as the gold standard in evidence-based healthcare* (St. Petersburg College, 2020).

WHO – Global research on coronavirus (COVID-19)

The WHO and the WHO library additionally fight on the front line against the disease. It was therefore decided for this research to analyse what they offer in terms of evidence-based information.

The WHO's purpose is to bring together scientists and leading health experts to acelerate the process of research and discovery. This is intended to help develop new norms and standards to contain the spread of the coronavirus pandemic and help the care of those affected.

The database created for the exchange of COVID-19 information is described as follows:

> *WHO is gathering the latest international multilingual scientific findings and knowledge on COVID-19. The global literature cited in the WHO COVID-19 database is updated daily (Monday through Friday) from searches of bibliographic databases, hand searching, and the addition of other expert-referred scientific articles. This database represents a comprehensive multilingual source of current literature on the topic. While it may not be exhaustive, new research is added regularly* (World health Organisation, 2021d).

6.1 Method for database analysis

In order to analyse the contribution of the Cochrane collaboration and the WHO, the author of the thesis used predefined categories. This was in order to represent in a univocal way both databases.

In detail, the chapters are divided into two parts:

1. In a first introductory part, the two organisations are presented in terms of the following:
   a. purpose,
   b. duties,
   c. territorial distribution,
   d. funding
   e. and resources and catalogues made available outside the pandemic context.

This is done to provide adequate context to the database being analysed, highlighting what their purposes are and which catalogues they provide outside of those created ad hoc for the COVID-19 pandemic.

2. In a second part, all the resources made available for combating COVID-19 are presented in terms of the following:
   a. registers,
   b. special collections,
   c. reviews
   d. and prioritization of questions.

This second part summarises all the catalogues and resources made available to address the COVID pandemic. In addition to the databases specifically created, how the institutions prioritize requests is summarised. This is because, as expressed by Featherstone, the number of requests for systematic review has dramatically increased, and, therefore, it was analysed how both institutions prioritize those requests.

6.2 Databases worth mentioning

As anticipated in the chapter's introduction, a large number of databases providing information based on medical evidence have emerged over the years, each with its own positive aspects. This sub-chapter makes brief mention of those identified as the three most important (leaving out Cochrane and the WHO).

All these databases are present in the previously mentioned resources of '*The Universitätsbibliothek Mainz*' and '*Brighton and Sussex University Hospitals library.*' In addition, these are the databases that have been (and are still analysed daily) by Cochrane to create its '*Cochrane study register*' (Cochrane, 2021b) ; (Universitätsbibliothek Mainz, 2021) ; (Brighton and Sussex University Hospitals, 2021a).

6.2.1 Medline

Medline is the main bibliographic database of the National Library of Medicine (additionally known by its acronym '*NLM*'). The database currently contains more than 27 million references to journal articles on life science topics with a focus on biomedicine. This number is set to grow rapidly given the increasing urgency and need for information by doctors and medical professionals. The journals used are selected on the basis of an expert committee that is part of the '*Literature Selection Technical Review Committee*'. Currently, Medline includes literature published from 1966 to current papers. More information about Medline can be found on their website: https://www.nlm.nih.gov/ medline/medline_overview.html (MEDLINE, 2021).

6.2.2 Embase

Embase is a database for biomedical literature and research. The purpose of the database is to create and make available systematic reviews. The goal is to have a comprehensive study of the published literature on a given subject in order to support decisionmakers in evidence-based medicine. The database covers the literature of international biomedicine, with papers from 1947 to the present day. More information about Embase can be found on their website: https://www.elsevier.com/solutions/embase-biomedicalresearch (Elsevier, 2021).

6.2.3 MedRxiv

MedRxiv is a free access archive that aims to provide the distribution of complete but not yet reviewed manuscripts (preliminary contributions of work that have not been certified by peer review).

It is important to emphasise that MedRxiv distributes comprehensive pre-prints in which health research and methodology are adequately described. Its publications include research papers, systematic reviews and meta-analyses, clinical research design proto-

cols and data articles. More information about MedRxiv can be found on their website: https://www.medrxiv.org/ (medrxiv).

6.3 Creation of new databases for COVID-19

Tomas Allen, head of the WHO Library, explained the motivations behind the creation of the WHO's global research database for COVID-related resources. This practice, as is further explored later on, is carried out by all the major organisations involved in disseminating evidence-based information.

As described in the introduction, the COVID-19 outbreak first took place and started in China, which is why, initially, all of the information regarding symptoms and treatment came from there. For medical librarians, information specialists and the medical world to process and use that literature was exceptionally more difficult than with other disease, as virtually all of the information that was available at that time was written in Chinese (an issue already briefly mentioned in the section related to clinical librarians and the language used to write medical publications). In the first instance, this involved and required much networking with colleagues and information specialists working in China, simply in order to access the information and make it available to people in other regions of the world as well. This did not only necessarily mean simply translating articles but also having the basic graphic data of what was being published in Wuhan.

There was a sizable time gap between this information being published in China, and it being indexed in databases (for example in Medline). Therefore, one of the significant actions and major duties of all database providers was to facilitate access to this literature for colleagues and the medical community around the world. This led, for example, to the creation of the '*WHO COVID-19 global search database*'.

The main duty of the database was the support of the rapid review and systematic review development process within the organisation.

The WHO was not the only organisation to create an internal database to collect COVID pubblications to simplify the review process: in fact, according to Allen, many international organisations did what the WHO did (created a database that was available to the public), which led to a profusion of databases created by various organisations (there were even more databases for a single institution) (Interview with Tomas Allen, 21.05.2021).

These considerations were confirmed by the interview conducted with Featherstone, a Cochrane Project collaborator: **Featherstone indicated that the main purpose of the Cochrane registry created for COVID-19 was to aid in the production of rapid re-**

views and revisions. This was to ensure that a review team could search that registry and discover all the individual references related to the question. In order to conduct reviews as quickly as possible, they attempted to make all the evidence available in one single location (Interview with Robin Featherstone, 13.05.2021).

One further difficulty in creating these catalogues is related to the rapid evolution of terms and ways of referring to COVID-19: when the pandemic started, nobody said *'COVID'*, and now everybody uses that specific term. When Cochrane built the first search strategy for the register, some words and conditions that are now in use did not exist. The search strategy and the terms used to describe the disease also changed with the development of the pandemic. For this reason, the register requires constant development changes and improvements (Interview with Robin Featherstone, 13.05.2021).

However, it is important to underline that, in addition to supporting the internal production of reviews (and therefore directly helping the medical world), these databases were made freely accessible to everyone, providing a further source of support to anyone searching for information.

6.4   Cochrane collaboration

As briefly mentioned in the previous chapter and the introduction, one of the largest institutions involved in providing and analysing medical data in a systematic way is Cochrane. Before assessing the offer and the number of resources about the COVID-19 virus, Cochrane is briefly analysed in certain of its main components.

6.4.1 Purpose

Cochrane is an independent non-profit international network established in 1993 with the purpose of collecting and synthesising accurate and up-to-date scientific evidence on the effects of health interventions on people (Cochrane italia, 2021).

Cochrane, in its 2020 strategy, aimed to achieve four main objectives:

- **GOAL 1: Producing evidence**
  'To produce high-quality, relevant, up-to-date systematic reviews, and other synthesized research evidence to inform health decision making' (Cochrane, 2020).
- **GOAL 2: Making our evidence accessible**
  'To make Cochrane evidence accessible and useful to everybody, everywhere in the world' (Cochrane, 2020).

- **GOAL 3: Advocating for evidence**

  'To make Cochrane the 'home of evidence' to inform health decision-making, build greater recognition of our work, and become the leading advocate for evidence-informed health care' (Cochrane, 2020).

- **GOAL 4: Building an effective sustainable organisation**

  'To be a diverse, inclusive, and transparent international organisation that effectively harnesses the enthusiasm and skills of our contributors, is guided by our principles, governed accountably, managed efficiently, and makes optimal use of its resources' (Cochrane, 2020).

6.4.2 Duties

Cochrane includes in its main duties the constant production of the '*Cochrane Reviews*'. These are aimed at anyone interested in consulting and utilising high-quality information to make medical and health care decisions. This includes doctors and nurses, family members, patients, researchers and even funders. Thanks to the scientific evidence provided by Cochrane, decisions can be improved towards the best possible care (Cochrane italia, 2021). This demonstrates that, despite dealing with purely medical topics, Cochrane reviews are addressed and available to anyone interested in reviews that answer a particular scientific question.

6.4.3 Territorial distribution

Cochrane is a global independent network with members and supporters in all parts of the world. Officially, Cochrane groups are present in 45 countries[16]. These groups aim to represent Cochrane within the country, promoting and supporting the use of Cochrane evidence and reviews in medical and health policy and practice, as well as supporting Cochrane members and citizens living there (Cochrane, 2021l).

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[16] The complete can be found here: https://www.cochrane.org/about-us/our-global-community

6.4.4 Funding

Cochrane does not accept any commercial, conflicting or advertising funding. This is to maintain independence and to allow its staff to carry out reviews freely and without external influence[17] (Cochrane, 2021k).

6.4.5 The Cochrane Library

The Cochrane Library consists of three main databases (Cochrane, 2021g):

1. *Cochrane Database of Systematic Reviews (CDSR),*
2. *Cochrane Central Register of Controlled Trials (CDR),*
3. *Cochrane Clinical Answers (CCAs).*

6.4.5.1 Cochrane Database of Systematic Reviews

The Cochrane Database of Systematic reviews includes all Cochrane Reviews written by information specialists, medical librarians and Cochrane staff (this could be people with statistical, medical or other areas of expertise).

A *'Cochrane review'* is a systematic review that has been written and checked by an editorial team (called the *'Cochrane Review Group'*). The purpose of a Cochrane review is the same as a systematic review: namely to identify, evaluate and summarise all the evidence and data that can be used to answer a specific research question (Cochrane, 2021f).

Health studies differ dramatically in what they research, which methodology they use and how well they are conducted. Therefore, the relevance of a study conducted well will be much greater than one conducted poorly. This is why systematic reviews are performed by Cochrane: all of these elements plus others (for example, conflict of interest or corporate funding) are taken into account when evaluating different studies that aim to answer a particular question (Cochrane, 2021c).

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[17] The list of institutions that collaborate with and fund Cochrane can be found here: https://www.cochrane.org/about-us/our-funders-and-partners

A Cochrane review consists of the following points (Cochrane, 2021c):

- *the way existing studies are found;*
- *how the relevant studies are judged in terms of their usefulness in answering the review question;*
- *how the results of the separate studies are brought together to give an overall measure of effectiveness (benefits and harms) – statistical techniques used to combine the results are called meta-analysis.*

In 2002, the '*International Journal of Technology Assessment in Health Care*' did an analysis of how many trials were present on average in a Cochrane review. Although the research is old, it is presented here to give an idea of how much time reading a Cochrane review saves medical staff. *In 1,000 Cochrane reviews there were 9,778 trials (Mallett & Clarke, 2002).*

Thus, a Cochrane review contains on average nine to 10 trials (this number may have changed over the years, but its indicative value is unchanged). In this manner, instead of having to read and evaluate 10 trials (and other relevant publications), doctors can simply read the review to receive the answer to their particular research question.

6.4.5.2 Cochrane Central Register of controlled trials

The Cochrane Central Register of Controlled Trials is a source that reports randomised and quasi-randomised controlled trials (Cochrane, 2021d).

Clinical trials are a type of research that studies possible treatments and assesses their effects and effectiveness on the health of the subjects undergoing the study. The following are usually tested: drugs, medical procedures (including surgery), preventive care and other medical treatments. People of all sexes and ages can participate in a clinical study (World health Organisation, 2021b). According to the WHO, a clinical trial consists of four phases (World health Organisation, 2021b):

1. Phase one: this phase is usually characterised by testing new drugs on a small sample of people. This is done to evaluate and identify side effects.
2. Phase two: in the second phase, treatments that have passed the first phase are tested on a larger sample of subjects.
3. Phase three: in the third phase, studies are expanded to populations in different regions and countries around the world.
4. Phase four: these studies take place in the country where these pharmacies are to be approved

Clinical trials may include '*randomised control trials*'. A randomised control trial is usually conducted to test the effectiveness of a drug or treatment for a particular disease. Those trials are considered the ideal to get reliable information about possible treatments. According to Cochrane, the standard procedure is the following: patients are divided into two groups: one group is given the drug to be tested, and the other (also called the *'control group'*) is given either conventional therapy or a placebo. The choice of which patients will be included in one or the other group is made in a randomised manner. This is done to ensure that the test is not influenced in any way by the researchers' choices. Once the test has been completed, both groups are subjected to analysis, and by comparing the results, it is possible to assess the effectiveness and any side effects of the drug tested (Cochrane, 2021c).

6.4.5.3 Clinical answers

Cochrane Clinical Answers (additionally known in short form as '*CCAs*') provide a readable, simplified and clinically focused approach to the rigorous research of the Cochrane Reviews. Cochrane Clinical Answers are designed to be quickly usable and to assist clinicians in making treatment and diagnostic decisions.

Each clinical answer consists of a specific clinical question, a short answer and the data for the Cochrane review results considered most relevant to practising healthcare professionals.

To summarise, a Cochrane review must meet at least these main criteria to be converted to a clinical answer (Cochrane, 2021a).

- **Generalizability or relevance of the review question**: the review addresses questions and decisions relevant to practising health care professionals and will have a broad audience.
- **Research date:** the review has a research date within the last five years and includes studies recent enough to inform current practice.
- **Volume of evidence**: the review contains sufficient evidence to draw conclusions, large volumes of evidence with inconclusive results that need to be explained, or has uncertain results based on underpowered analyses that should be highlighted

6.4.6 Cochrane and its role in the COVID pandemic

Cochrane fights on the front lines of the COVID pandemic, providing all of its resources and the expertise of its teams and making as much information available as possible.

Cochrane is involved in many different projects, ranging from COVID-19 convalescence for pregnant women to instructions to healthcare professionals on how to adequately protect themselves from the disease.

This paper presents what has been considered the three most relevant sections in the fight against the disease:

1. The Cochrane COVID-19 study register,
2. Cochrane's work on COVID-19-related reviews,
3. Cochrane's special collections.

6.4.6.1 Cochrane COVID-19 study register

The 'Cochrane COVID-19 Study Register' is a continuously updated public access reference collection of COVID-19 disease studies. The purpose of the register is to support rapid evidence synthesis, including Cochrane's work on rapid reviews in response to COVID-19 (Cochrane, 2021b). McDonald, a member of the Australian National Pandemic Management Taskforce, describes Cochrane's contribution and aims as follows:

> *Cochrane's COVID-19 study Register is an essential resource,*
> *enabling us to quickly and efficiently identify a broad range of studies*
> *that might be relevant, particularly when evidence from randomised*
> *studies is still relatively limited. The daily updates to the Register, plus*
> *the breadth of sources covered and its annotations and report-linking*
> *features, enhance the value of the Register as an information resource*
> *for our guidelines* (Mcdoland, 2021).

The registry aggregates more than 70,000 studies, providing a solid foundation for anyone seeking covid-related information and research (Cochrane, 2021b).

6.4.6.2 Cochrane's work on COVID-19 related reviews

As seen in the introductory chapter about the peculiarities of Cochrane, one of its main specificities are the reviews performed by medical librarians and information specialists, through which medical practitioners can have quick access to information from different trials and other relevant publications combined. These reviews were additionally created for COVID-related topics. The database can be consulted at the following link: https:// COVIDreviews.cochrane.org/search/site.

Cochrane has set itself three main objectives regarding the reviews section in regard to the COVID pandemic.

1. *'Inform front-line medical staff, policy makers and consumers about the priority reviews Cochrane has published or is actively pursuing'* (Cochrane, 2021e).
2. *'Direct researchers to priority areas for Cochrane Reviews that have emerged through consultation with content experts and Cochrane Groups'* (Cochrane, 2021e).
3. *'Provide resources for authors to conduct high-quality rapid reviews and clear information about what to expect from the editorial process'* (Cochrane, 2021e).

Cochrane has demonstrated the ability to quickly adapt to the situation and the urgent information need. For this reason, in addition to their classic reviews, they adapted '*Cochrane Rapid Reviews'* (Cochrane adaptation to the previously mentioned rapid reviews).

> *A form of knowledge synthesis that accelerates the process of conducting a traditional systematic review through streamlining or omitting specific methods to produce evidence for stakeholders in a resource-efficient manner* (Cochrane, 2021i).

6.4.6.3 Prioritization of questions

An important aspect of the Cochrane reviews related to COVID-19 is the prioritization of questions requiring a review. In fact, as described in the introduction, in this pandemic, information is needed at a great speed. Cochrane actively works with the WHO and others to gather and answer as many questions as possible. These questions are featured in the Cochrane review bank (Cochrane, 2021m).

To more ideally divide the questions worthy of review, Cochrane has created three priority areas (Cochrane, 2021m):

1. The questions with the highest priority for Cochrane are currently those related to **clinical management**. This category includes questions related to: *'screening and testing, drug treatment, critical care, prophylaxis, prognosis and the clinical management of pandemic-related impacts on health'*.
2. In second place on Cochrane's scale of priorities are questions related to **public health measures**, divided into the following topics: p*revention of infection, personal protection and the need to support healthcare workers.*
3. In third place are questions related to **economic and social responses**: this includes questions related to the social determinants of health and their impact on health outcomes and the impact of COVID-19 on food poverty.

6.4.6.4 Cochrane Special Collections

Cochrane Special Collections are developed in collaboration with Cochrane information specialists, medical librarians, Cochrane collaborators and the WHO. The purpose of the collections is to bring together multiple Cochrane reviews in key topic areas related to the prevention, course and treatment of COVID-19. The collections are not only aimed at physicians and professionals but also at ordinary people: for example, collections presenting evidence on smoking cessation during the pandemic can be found (Cochrane, 2021h).

6.5   World Health Organization (WHO)

Before defining WHO's role in the current COVID-19 pandemic, as with the Cochrane collaborations, several of its key features are presented, namely a general overview of the WHO and then the contribution in the pandemic.

6.5.1 Purpose

As with the history of evidence-based medicine, the Treccani encyclopaedia provides a detailed historical overview of the WHO. The key elements are summarised below.

The WHO was established with the same intention that led to the creation of the United Nations system by the convention adopted in New York in 1946, which came into force in 1948. Today, the WHO has its headquarters in Switzerland, more precisely in the city of Geneva. Since 1948, it has been one of the specialised institutes of the United Nations (Enciclopedia Treccani).

The WHO is composed of the following (Enciclopedia Treccani):

- The World Health Assembly, a body that defines the policies and budget of the Organisation and discusses issues requiring action and investigation;
- The Executive Board, composed of 34 experts in health matters, responsible for implementing WHO policies;
- The Secretariat, chaired by the Director-General appointed by the Assembly

6.5.2 Duties

The main goal of the WHO is to ensure that all the world's populations achieve the highest possible level of wealth. This is to be understood as physical, social and mental well-being. To achieve this ambitious goal, the WHO actively promotes cooperation between

nations in the field of healthcare. Of particular importance is the fight against infectious diseases and the management of global health emergencies. These aspects are analysed in detail in the chapter on WHO's contribution to combating COVID-19. Among the most significant acts on infectious diseases adopted by WHO is the International Health Regulations of 1969. This act consists of a set of rules and procedures concerning the management of global health, which nation states are invited (but not obliged) to identify infectious diseases and limit their spread through appropriate measures. These rules were updated in 2007 to ensure that they could be implemented for the previous SARS pandemic and other particularly infectious influences (Enciclopedia Treccani).

6.5.3 Territorial distribution

The WHO operates globally and has headquarters all around the world. The organization has 194 member states, and the oversight of these states is entrusted to regional offices. Each office is responsible for overseeing multiple countries (World health Organisation, 2019b, S. 9):

Region	Regional office	Location	Number of Member States covered
African Region	Regional Office for Africa	Brazzaville, Congo	47
Region of the Americas	Regional Office for the Americas	Washington DC, USA	35
Eastern Mediterranean Region	Regional Office for the Eastern Mediterranean	Cairo, Egypt	21
European Region	Regional Office for Europe	Copenhagen, Denmark	53
South-East Asia Region	Regional Office for South-East Asia	New Delhi, India	11
Western Pacific Region	Regional Office for the Western Pacific	Manila, Philippines	27
Total			194

Figure 9: World Health Organisation distribution (World Health Organisation, 2019b)

6.5.4 Funding

WHO is funded by two main sources of income (World health Organisation, 2019a):

- **Countries' membership dues:** this is the fee that must be paid by countries to join the organisation. The amount each country is required to pay is calculated in relation to the country's wealth and population. This means that each country pays a different contribution.
- **Voluntary contributions:** Voluntary contributions come from member states (in addition to their estimated contribution) or other partners. These contributions account for more than three-quarters of the Organization's funding. A list with a breakdown of voluntary contributions for 2018–2019 can be found here: https://www.who.int/about/funding

6.5.5 The WHO library

The WHO Library is the world's leading library for public health issues and topics. Its purpose is to provide access to WHO publications and other sources of medical knowledge produced by other organisations around the world.

The WHO and the library carry out various initiatives and make different catalogues available to the public. Among these, the following are particularly worthy of mention (World health Organisation, 2021g):

1. Institutional Repository for Information Sharing (IRIS) (World health Organisation, 2021g),
2. The Global Index Medicus (GIM) (World health Organisation, 2021g),
3. The International Clinical Trials Registry Platform (ICTRP) (World health Organisation, 2021f),
4. Hinari (World health Organisation, 2021a).

6.5.5.1 Institutional Repository for Information Sharing (IRIS)

The IRIS is a multilingual digital library that collects and makes freely available all intellectual output from and about the WHO. It collects, stores and disseminates the WHO's public health knowledge, technical guidance, and scientific decisions worldwide (World health Organisation, 2021g).

The contents of the IRIS database include the following (World health Organisation):

- Publications by WHO from its phonation from 1948 to the present,
- Individual records for articles in periodicals produced by the WHO,
- Individual records for articles in scientific journals concerning or relating to WHO activities worldwide.

6.5.5.2 The Global Index Medicus

The Global Index Medicus (additionally known by its acronym '*GIM*') is a database that provides global access to all biomedical and public health literature produced from and within low-income countries. The main purpose is to increase the visibility and global accessibility of this particular collection of resources. The documentation is collected and aggregated by the WHO regional office libraries on a central search platform that allows for the retrieval of bibliographic and full-text information (World health Organisation).

6.5.5.3 The International Clinical Trials Research Portal (ICTRP)

The ICTRP is manged by the WHO and aims to provide a centralised access point to information on current and completed clinical trials (the function and peculiarities of which are described in the previous chapter). The research database contains trial registration datasets made available by data providers worldwide.

In order to facilitate the search for trials within different countries and language areas, it is possible to search for trials registered in certain Primary Registers in the following languages: Chinese, Dutch, German, Japanese, Korean, Persian, Portuguese and Spanish (World health Organisation, 2021f).

6.5.5.4 Hinari

Hinari provides free or very low-cost online access to leading biomedical and social science journals in developing countries. The program was launched 20 years ago, more precisely in January 2002, with approximately 1500 journals from 6 major publishers: Blackwell, Elsevier Science, Harcourt Worldwide STM Group, Wolters Kluwer International Health & Science, Springer Verlag and John Wiley. Since then, the number of participating publishers and the number of journals and other resources has grown steadily, now numbering up to 85,000 information resources (World health Organisation, 2021a).

6.5.6 The WHO and its role in the COVID pandemic

In this chapter, as with Cochrane, the efforts of WHO in making available evidence-based data and information in the fight against the current pandemic is explored. The contribution of the WHO and the WHO library has resulted in the creation of the Global Research Database.

6.5.6.1 The Global Research Database

In order to provide as much information as possible, the WHO gathers all the latest international scientific findings, analyses and knowledge about COVID-19. The database is kept up-to-date with daily updates. The information is taken from various bibliographic databases[18], manual searches and the addition of other scientific articles recommended by experts. The database represents a comprehensive multilingual source of current literature on the subject (there are articles in more than 40 languages, although a majority are in English) (World health Organisation, 2021d). The database currently contains

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[18] list can be found here https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/

315188 documents (as of 29/07/2021). Among these are journal articles, clinical trials and other publications relevant to COVID-19 (World health Organisation, 2021c).

6.5.6.2 WHO work on the production of reviews

The WHO further offers its contribution to the medical world through the systematic review process. Allen described his involvement in the committee responsible for the rapid review of COVID-19 related documents and emerging evidence. The group consisted of librarians, information specialists and staff with medical expertise. As with the example given by Cochrane, there was frequently no time to work through a normal review process; thus, the rapid review process was adopted in this case as well. As far as the WHO is concerned, the need to perform these reviews quickly is probably more pronounced (to the extent possible) than the rest of the institutions dealing with them: in fact, included among the WHO's tasks is the development of manuals and guidelines to be used by the medical community (for example, guidelines that include norms and standards). Since the explosion of the pandemic led to a dramatic increase in the number of requests received, it was necessary to review the available evidence incredibly rapidly (Interview with Tomas Allen, 21.05.2021).

6.5.6.3 Prioritization of questions

The WHO and the WHO library internally manage the choice of which research questions require systematic review and which should be given the highest priority. There is a committee within the WHO responsible for rapid review. However, the WHO collaborates closely with hospitals, countries and other international bodies in the medical field. Therefore it is possible that the choice of questions and priority is determined through these collaborations (Interview with Tomas Allen, 21.05.2021).

To accelerate the process and improve coordination at an international level, the WHO has additionally activated the '*R&D Blueprint'*. The purpose of the Blueprint is to improve coordination among scientists and global health professionals around the world, thereby accelerating the research and development process and improving overall global response. The world's leading scientists on COVID-19 met at the WHO headquarters to report on the current level of knowledge about the new virus. This enabled them to determine which questions needed to be answered most urgently through reviews (World health Organisation, 2021e).

6.6   Relevant information from the survey for the chapter 'Which institutions are involved in the research and exchange of information in the fight against COVID'
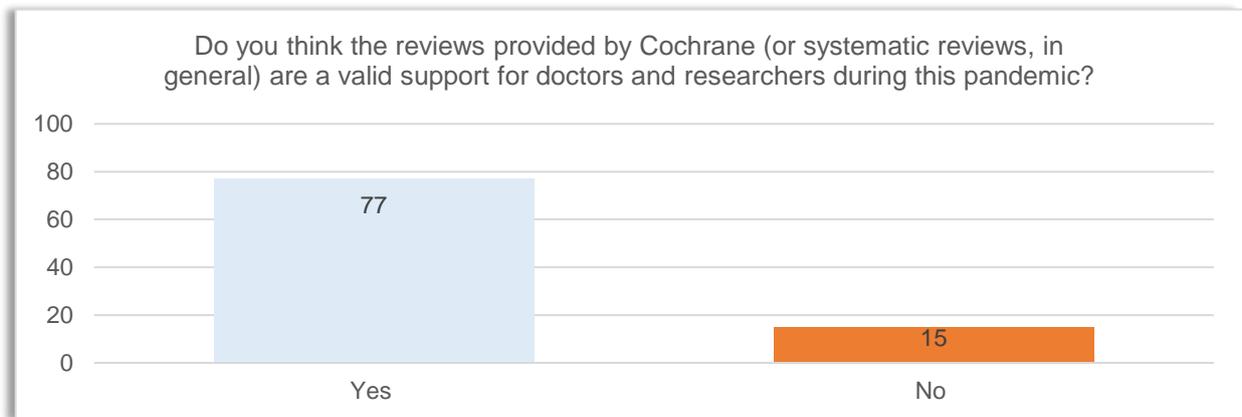

Figure 10: Assessment of systematic reviews (Personini, 2021)

Both Cochrane and the WHO library over the years have been responsible for producing systematic reviews to provide information to the medical world in a detailed and reliable manner. In this question, librarians were asked if they felt that these reviews had been an effective tool during the pandemic.

The majority of librarians (84%) expressed themselves in favour of systematic reviews as a useful tool.

Among the main motivations of those who considered them ineffective, there was a criticism regarding the length of the process necessary to create a systematic review: excessively long with respect to the medical world's need to obtain information (for this reason, rapid or living reviews have additionally been adopted). Here are several comments about this issue:

'Rapid reviews, yes. Systematic reviews with proper methodology aren't really suited to the fast-paced early days of a pandemic'; 'they are very valid, but they are not something that is quick to do, so would not be very timely for a rapidly changing situation like a pandemic'; 'I think systematic reviews are brilliant, but they just cannot be produced fast enough to cope with the changing information in a pandemic situation. Repeated rapid reviews are what is needed. Pragmatism must hold away rather than perfectionism' (Personini, 2021).

One more issue highlighted by several librarians was the sources used: systematic reviews are done through a predefined and precise process, but if the sources used are

not peer-reviewed, their reliability cannot be guaranteed: '*It's hard to write a good systematic review on what initially had no data, then lots of poor-quality data, and is still a very fast-moving subject*' (Personini, 2021).

Another aspect that is presented in this chapter is the presence of numerous databases that provide information based on medical evidence and therefore additionally about COVID-19. For this question, the librarians were asked which database they considered the most complete for finding information about the pandemic.
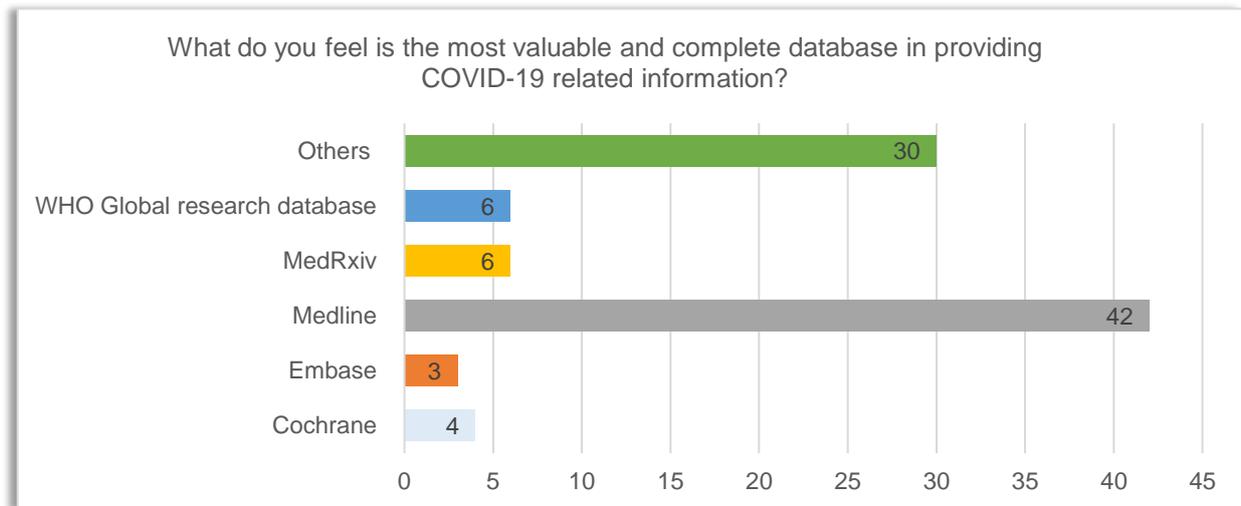
Figure 11: Database preferences (Personini, 2021)

The vast majority of librarians chose Medline as the best database, with 46% of preferences. This was followed by MedxRiv and the Global Research Database with 7%, Cochrane with 4% and Embase with 3% of the preferences.

Librarians who chose '*Others*' as an option indicated that it was inappropriate to limit the search choice for such an important and changing topic to a single database. Below are several explanatory comments: '*It depends on what phase of the pandemic we were in. Early on you really had to search multiple places to be sure. It also depends what *kind* of literature. I'd look in different places if I wanted primary studies vs reviews*'; '*I can't choose, as it depends on the aspects of COVID-19 that I am looking into. For example, for COVID variants, I use WHO pre-prints, Embase and Medline. For behaviour science and COVID, I would include PsycInfo*' ; '*I wouldn't use a single database. I'd choose the database depending on the exact topic and, if necessary, use other sources too – publisher websites etc*' (Personini, 2021).

A final aspect that was assessed was whether the librarians felt that the information, journal articles, pre-prints and reviews made available were sufficient to meet the information needs of the medical world.
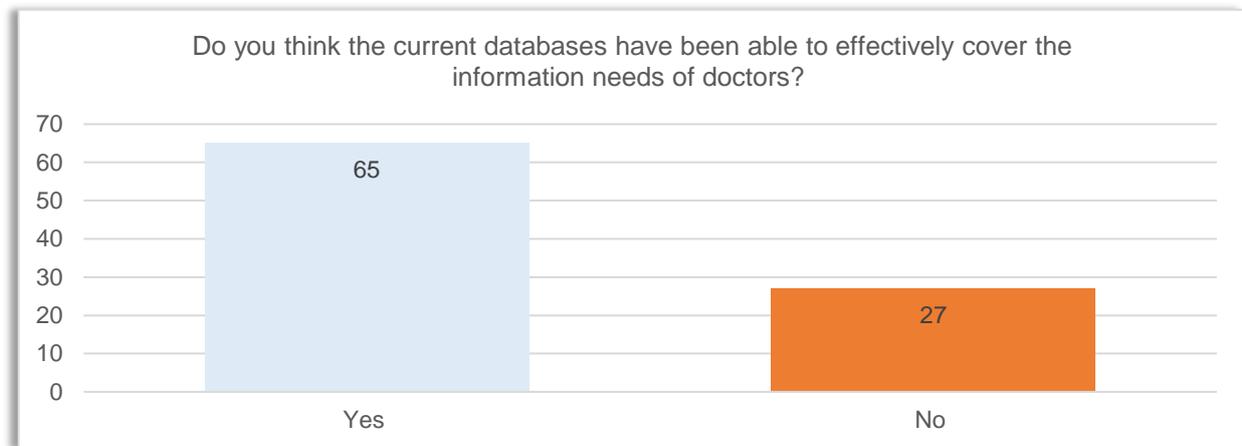

Figure 12: Assessment of the contribution of databases (Personini, 2021)

Of the librarians, 71% felt that the work done by the databases was sufficient, while 29% (which was still a high percentage) felt that the information needs were not fulfilled. Among the comments in favour of the work done by the databases were the following:

'Databases and providers have done a great job collating information, resources, search strategies' ; 'They have done their best – but as it is a new and fast-moving virus then information can only be disseminated once it has been gathered' (Personini, 2021).

Among the reasons that led librarians to respond negatively were issues highlighted in previous responses, namely, on the one hand, the occasional low quality of the sources made available and, on the other hand, the time it took for catalogues to index and make sources accessible. The following comments summarises the two issues: *'At a certain point in the pandemic, details were coming out faster than they could be indexed. At that time, we had to also search pre-print servers because the databases weren't indexing things fast enough or things weren't formally getting published and were just being released as pre-prints' ; 'Existing databases supplemented with pre-print servers have sufficed, but pre-print servers bring their own problems with non-peer reviewed material – it turns into the Wild West in terms of reliability'* (Personini, 2021).

6.7   Chapter conclusions

The present chapter provides an overview of several databases that provide information to fight the COVID pandemic and with which medical librarians and information specialists actively collaborate. Each database and its staff attempted to respond in a prompt

manner and support the medical world. This led, in the first place, to the creation of several internal databases with the aim of collecting as much information as possible to support the production of systematic, rapid and living reviews. Tomas Allen, head of the WHO library, has been involved in working with the medical community on several pandemics and has drawn a preliminary assessment of the work done by the various databases, suggesting insights for possible future improvements.

As Brbre pointed out, in the case of new pandemics, there will be a need for more coordination among the international organisations that respond to the pandemic.

> *In the future, if there is an outbreak of a disease like COVID-19, all the librarians from the major organisations should get together quickly and decide how to move forward collaboratively. This is not about making a plan but more about finding the key people in the major organisations. This group of key people should then talk together and compare what they do with each organisation to ensure that the work can be ideally coordinated and reduce duplication. What has happened during COVID-19 is that many organisations do what the WHO (or other organisations) do. This has led to much duplication* (Interview with Tomas Allen, 21.05.2021).

In general, apart from the problems presented and the presence of duplicates, databases have been shown to be able to effectively adapt to the pandemic situation, for example, by adopting a less precise but faster review production system. This has met the medical community's need for information.

7   Clinical librarians and COVID patient care

The chapter related to the skills and tasks of clinical librarians defines what role they play within clinics in support of physicians, highlighting the fact that they provide assistance to medical staff in their daily activities, including attending meetings and patient case rounds. During the most critical months of the pandemic, there was a succession of newspaper articles highlighting the difficult and extreme conditions in which doctors around the world were asked to work. The web and social media were flooded with pictures representing the difficult situation in intensive care units. To provide a practical example, '*Il Corriere Della Sera*' underlined the situation in Wuhan in the first months of the pandemic: the situation described by doctors seemed to come straight from a war scenario. The working conditions presented were difficult, although not apocalyptic; of particular impact were the testimonies referring to the use of protective suits for eight hours, preventing doctors from doing normal practices such as hydrating themselves, eating or going to the bathroom. The shifts were additionally intensive and prolonged (Turin, 2020).

These extreme working conditions not only occurred in Wuhan but everywhere the epidemic spread in a markedly short period of time. This chapter first presents an assessment of what measures physicians needed to implement to treat patients heavily affected by the disease and, in a second step, presents the survey and interviews questions asked to clinical librarians about whether they had to cooperate in these care practices. Since the hospitals were under significant pressure and the clinical librarians collaborated directly with the physicians, it cannot be ruled out that, due to the extreme situation, they were asked to contribute in this area as well. In addition to treatment techniques, it was possible to have a general picture of the transmissibility of the virus and thus understand the motivations behind the choice of communication of information of public utility by the medical libraries regarding social distancing around the world.

7.1   General regulations for COVID-19 patient care

This subchapter provides a brief summary of the possible courses of COVID-19 as a disease and summarises what medical treatments are currently available and utilised. Since this is not a medical paper, these aspects were covered superficially but sufficiently to define the possible tasks that clinical librarians might have had to assume in case of a lack of staff and overcrowded hospitals. The '*Bundesamt für Gesundheit*' of Switzerland and the WHO were used as references to gather all the medical information.

7.1.1 Transmissibility of COVID-19

The COVID-19 virus is transmitted from person to person in a majority of cases through prolonged physical contact over a short distance (less than the previously defined 1.5 metres). The more prolonged contact is with an infected person, the greater the likelihood of infection.

According to the information currently available to the scientific community, the virus is transmitted through two main channels (Bundesamt für Gesundheit BAG, 2021a):

1. **Through droplets and aerosols**
   When an infected person breathes, talks, sneezes or coughs, the droplets containing the virus can end up directly on the parts of other people that can be infected (for example the mucous membranes of the nose, or in the eyes). This type of contagion only occurs in cases where the imposed distance of 1.5 metres is not maintained (Bundesamt für Gesundheit BAG, 2021a).
   The WHO confirmed the statement of the '*Bundesamt für Gesundheit*', with lighter recommendations regarding the minimum distance to be kept: 1 meter (short-range) (World health Organisation, 2020a).
   For this reason, as seen in the chapter related to the dissemination of public information, it is important to maintain a safe distance between one person and another, as well as use appropriate protective equipment.
2. **Through surfaces and hands**
   This type of contagion occurs when a healthy person comes into contact with an infected surface with his or her hands. If the hands touch the nose, mouth or eyes, there is a possibility of contagion although there has been no physical contact with another infected person (reason why the books were being disinfected and quarantined at the library where Brbre worked). Including in this case, the information disseminated by libraries on hand sanitation is of fundamental importance to reduce contagions (Bundesamt für Gesundheit BAG, 2021a) ; (World health Organisation, 2020a).

7.1.2 Possible courses of the disease

A COVID-19 infection can take a different course from one person to another, with factors such as age, pre-existing conditions and early treatment playing an important role in the patient's recovery. The '*Bundesamt für Gesundheit*' presents four possible courses of the disease. Of interest to the thesis are the courses that require medical attention: the '*severe course*' and the '*critical course*' (Bundesamt für Gesundheit BAG, 2021a).

1. **Severe course:** In the case of the severe course, the sick person may present with a high and persistent fever, a feeling of sickness and breathing difficulties, which in the most serious cases lead to pneumonia. In these cases, hospitalisation is necessary.
2. **Critical course:** In cases of the critical course, the above-mentioned symptoms of respiratory distress worsen to such an extent that admission to intensive care is necessary, and the patient must be kept alive by means of artificial respiration support.

7.2   Clinical librarians contribution

To assess whether clinical librarians had to actively participate in patient-care procedures, a specific question was asked in the survey. Librarians who positively respond to this question were asked which of the previously mentioned treatments they took part in, namely as follows:

- Help and support for mechanical ventilation-related practices related to patients with critical symptoms.
- Help and support for medication administration practices related to patients with severe symptoms.

In addition to the survey, during the interview with clinical librarian Igor Brbre, he was asked whether he had to actively participate in measures related to patient care.

7.3   Relevant information from the survey for the chapter *'Clinical librarians and COVID-19 patient care'*
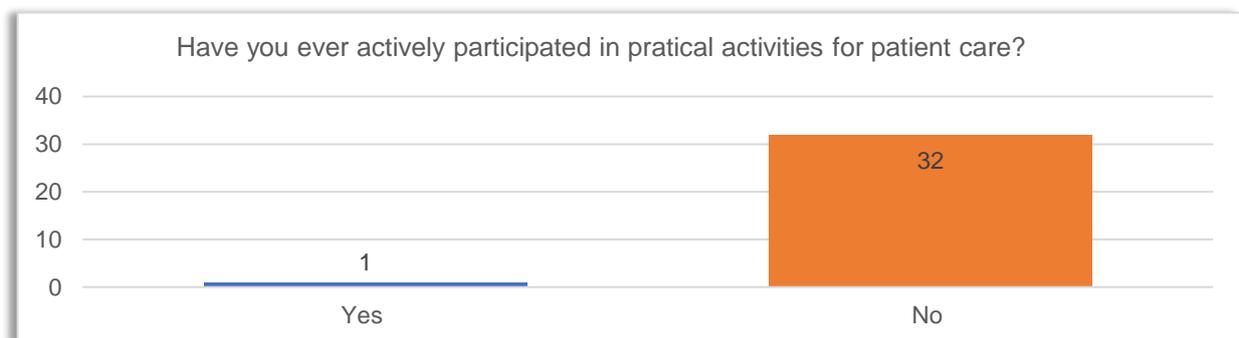
Figure 13: Contribution of clinical librarians in care practices (Personini, 2021)

Clinical librarians who participated in the survey were asked if they were involved in activities directly related to patient care.

Only one survey participant (3%) acknowledged participating in activities related to patient care, demonstrating that hospitals had not had a strong use of clinical librarians for

direct support in care practices for the most severe patients. Moreover the librarian did not contribute to any of the previously defined activities, but to a secondary support task.

This type of secondary activity in support of physicians is described precisely by Brbre during his interview: in his experience in this pandemic, several libraries were occasionally taken over to be turned into vaccination sites and librarians were redeployed to assist in other areas.

> *In smaller medical libraries, some staff members were reassigned to*
> *clinical areas. Their tasks were not aimed at supporting the medical*
> *staff in purely clinical practices, but more related to administrative tasks*
> (Interview with Igor Brbre, 26.05.2021).

Brbre also provided a list of examples of administrative tasks in which librarians had to participate: retrieving and searching patient records and other duties related to organising or distributing personal protective equipment (also known as '*PPE*') (Interview with Igor Brbre, 26.05.2021).

The publication *'Critical care work during COVID-19: a qualitative study of staff experiences in the UK'* has confirmed what was stated by Brbre and describes the process of creating critical care wards and reassigning medical personnel: COVID-19 resulted in the transformation of several areas, wards and recovery zones (such as theatres in the example provided in the article or libraries in the Brbre example). However, the medical effort was not limited to the readaptation of spaces to suit the critical care treatment of patients: the assimilation of staff reassigned to the new critical care teams took place. Adapting to these new circumstances proved challenging, with staff reporting difficulty in locating equipment and supplies and identifying who was responsible (Montgomery et al., 2021).

7.4   Chapter conclusions

This brief chapter summarises the possible courses of the COVID-19 disease that require hospitalisation and specialised medical treatment. Due to the highly contagious nature of the disease, many of these serious cases occurred within a short period of time (additionally called outbreaks), placing strain on the operational capabilities of hospitals. Librarians in hospital libraries and embedded in medical teams were additionally affected by these spikes in infections. They were not required to directly participate in care practices but, in many cases, were reassigned to assist in clinical areas, with duties related to administrative work. This demonstrates once again how clinical librarians fully meet the

initial definition of '*embedded librarian*', which means to support the team to which they are affiliated in any way possible, including to perform tasks that are not in their default duties. One of the reasons behind this non-utilisation of clinical librarians in clinical care practices is probably related to the lack of sufficient medical expertise in healthcare settings. The medical world has therefore sought to utilise librarians by exploiting their competencies in organisational tasks such as the organisation and distribution of protective materials. Another reason is probably the use of previously retired staff to cover needs in the intensive care areas. The British Medical Association in its documents provides indicative numbers regarding the return from retirement of doctors in the UK, a country where there is a strong collaboration with clinical librarians: approximately 28,000 (as of 05.02.2021) previously retired doctors have decided to return to help in the battle against the disease (British Medical Association, 2021).

This phenomenon also occurred in Australia and North America (Scott, Lloyd & Florance, 2020) ; (America Medical Association, 2021).

8   Evaluation of survey results

This chapter presents the evaluation of the results of the survey to establish whether librarians encountered any new tasks during these emergency months and to confirm at a quantitative level what was discovered through the interviews. The analysis was conducted in three phases:

1. The first phase described the demographic and geographic information of the survey participants.

2. In the second phase, a division was made between clinical and medical librarians. This was done because, as presented in the first chapter, their duties could differ; therefore, it could not be excluded that one category of professionals experienced more changes in their daily activities than the other. In this first division, it was evaluated how many clinical and medical librarians had encountered new tasks and if these tasks were outside their areas of expertise. Through these steps, it was possible to answer the hypothesis.

3. In a third phase, more general questions were asked to librarians to define whether they perceived their work during the pandemic as particularly different from what it was before and in what areas they felt there was a major need for the evolution of the profession.

8.1   Geographical and general data
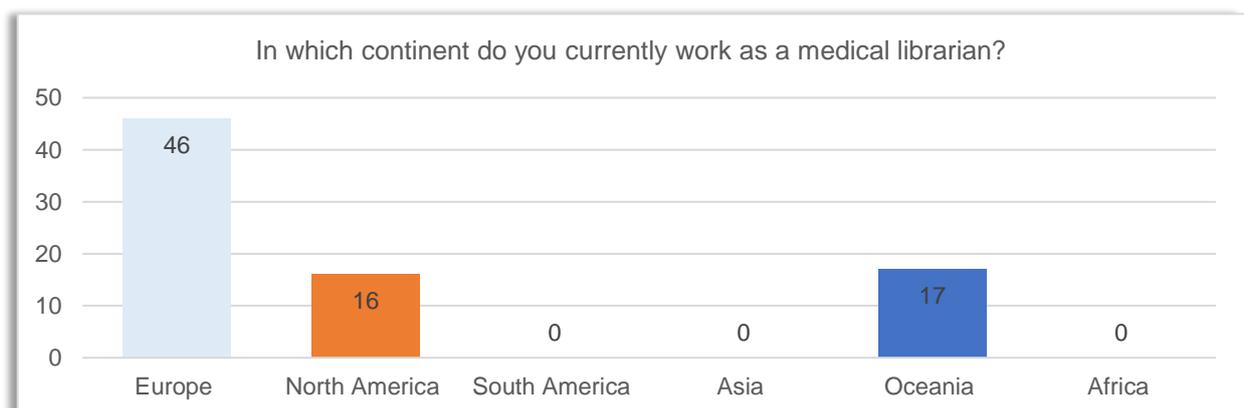
Figure 14: Sample of responses obtained (Personini, 2021)

As mentioned in the introduction and in the chapter regarding the evolution of the concept of clinical and medical librarianship, this particular profession has developed to a sufficient degree to support doctors in the COVID-19 pandemic mainly in three geographical areas:

Oceania, United Kingdom and North America
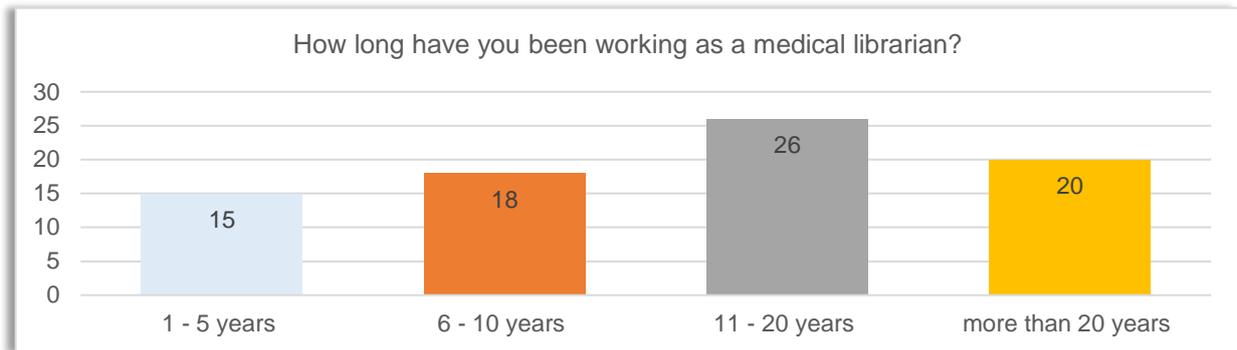
Figure 15: Participants' work experience (Perosnini, 2021)

As can be seen from the results of the survey, with the use of mailing lists, the author of the thesis was able to have contributions from all the designated nations, thus ensuring a homogeneous sample of responses and not only one geographical area. With regard to experience and time working in the field of medical and clinical librarianship, various contributions were obtained as well: the majority of participants had been working in the sector for more than 10 years, but there were additionally librarians who had only been working for less than five, or even more than 20 years.
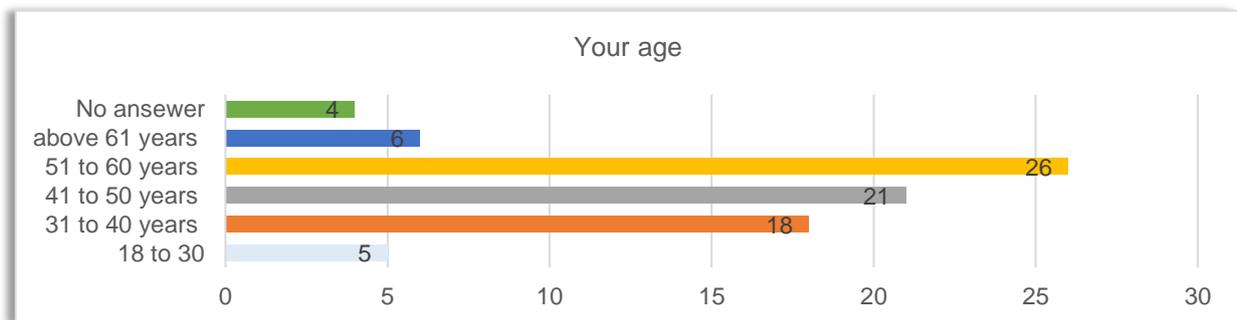
Figure 16: Demographic information 1 (Personini, 2021)
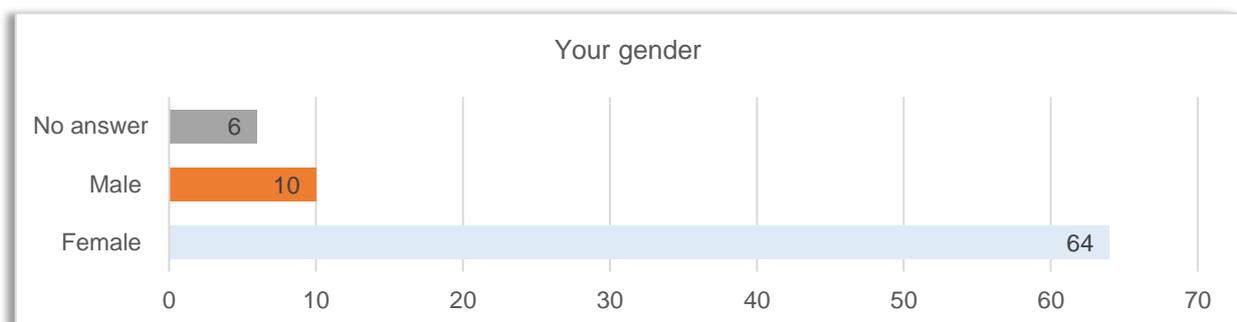
Figure 17: Demographic information 2 (Personini, 2021)

Above are two graphs showing the gender and age of participants who were willing to provide their information. While this data was not influential in answering the hypothesis, it offered insight into the category of people working as librarians in those areas.

8.2 Evolution of work during the pandemic

The following sub-chapter refers to the survey responses to determine if librarians encountered new tasks. To determine whether clinical or medical librarians encountered new duties, the survey author asked the following questions:

- Initially, librarians were asked if they encountered any new tasks during the pandemic. This provided an initial filter to the responses.
- The librarians who had to perform new tasks were then asked two additional questions in order to determine if these tasks were outside of their areas of expertise and if they were likely to remain after the end of the pandemic.
- The data from the two graphs above were then compared. Only responses that passed the two filters were considered in answering the hypothesis.
  - **New tasks that were outside the area of expertise and are to be performed as well after the end of the pandemic.**

Based on the comments, an attempt was then made to summarily and generically define what these tasks were. This was done to assess in what direction the profession could evolve in the years to come.

The comments were divided into tasks related to the pandemic, and tasks that could also be performed in the future.

Survey participants are divided into 74 medical librarians (8.3) and 33 clinical librarians (8.4).

8.3 Change in daily tasks for medical librarians

8.3.1 New tasks

Slightly more than half (51%) of the medical librarians answered that they had encountered new tasks during the pandemic. This first response demonstrates how, nonetheless, a large number of professionals had to undertake new assignments *(Table 21)*.

8.3.2 Domain of expertise

Of this 51% of librarians who were given new duties, 53% were outside the study skills of medical librarianship. This question was asked because, in certain cases, it was possible for librarians to be given new tasks that remained within their studied areas of expertise. Featherstone, who had to devote more time to the prioritization of questions, provi-

ded an example of this diversification. For her, this was a new task, but it was nonetheless an activity that was already being done by other medical librarians *(Table 19).*

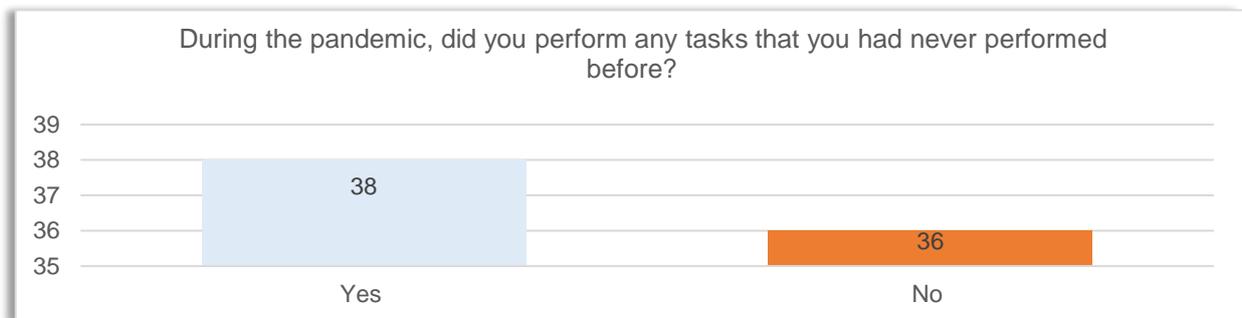### 8.3.3 Permanence of tasks at the end of the pandemic

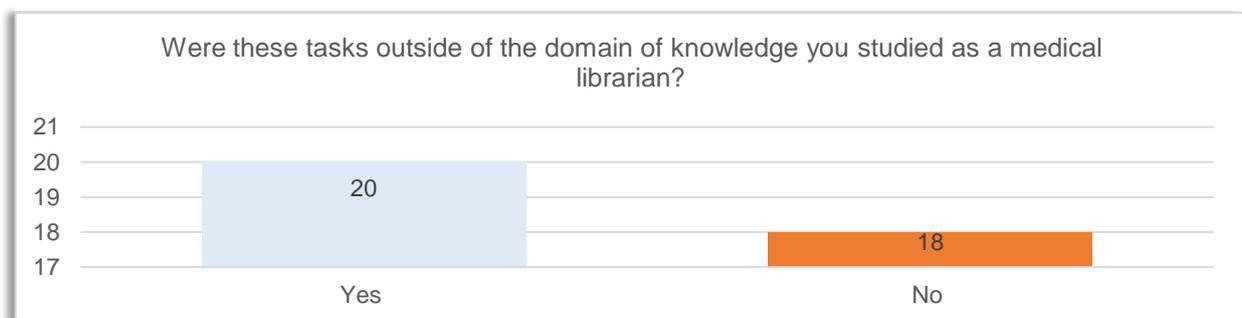Figure 18: Emergence of new tasks for medical librarians (Personini, 2021)

Figure 19: Tasks outside the area of expertise for medical librarians (Personini, 2021)

A second question that was asked to the librarians who had incurred new duties was whether they thought these duties were to be maintained after the end of the pandemic or if they would only be needed during the emergency. Of the answers, 50% were positive, and 50% responded negatively *(Table 20).*
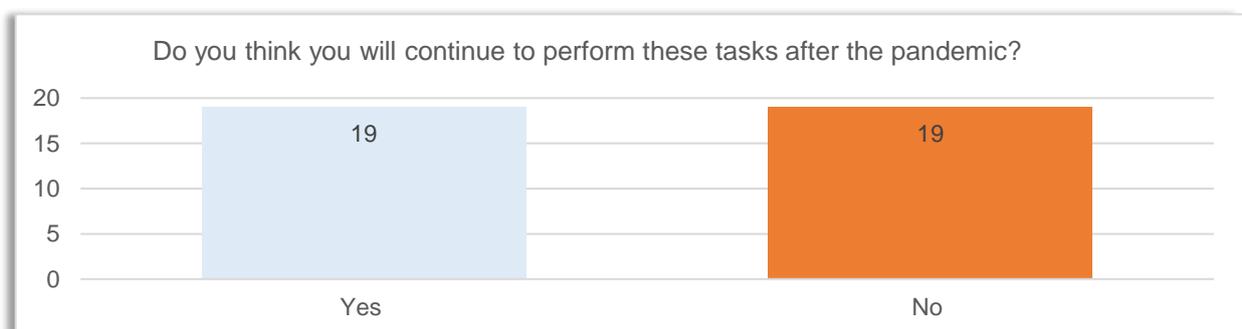
Figure 20: Tasks that would be maintained at the end of the pandemic for medical librarians (Personini, 2021)

8.3.4 Tasks that met both requirements
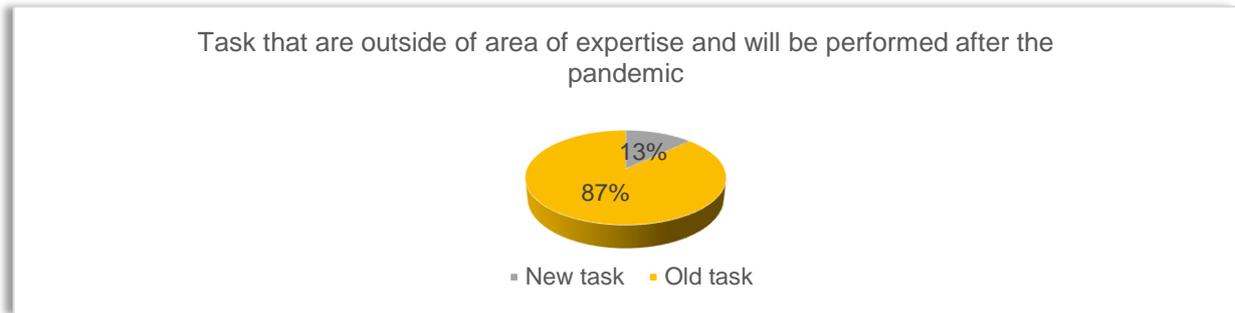
Figure 21: Assessment of new tasks for medical librarians (Personini, 2021)

To obtain an actual count of the tasks that were both outside of the study area and would additionally be performed after the end of the pandemic, the two graphs above were compared.

Only 12% of medical librarians performed tasks that were both outside of their areas of expertise and were expected to remain as well at the end of the pandemic.

| Task related to emergency	Tasks that may be additionally performed outside of the emergency
Working in vaccination clinic at hospital	The creation of recorded closed caption instructional content to meet the professional development needs of clients to develop skills in information literacy
Cleaning	During Covid I did evidence screening and minor synthesis which are normally outside of my usual role
Screening staff and patients for COVID as they entered the hospital	I've not previously searched pre-print repositories like MedRxiv before for prepublication articles, only PubMed.
Contact tracing, health care staff scheduling, conducting focus group interviews, working in a vaccine clinic and in the background of the vaccine clinic	Design active pedagogy exercises for online learning; synthesize the dental literature and information from a listserv to inform faculty decisions
Volunteering on COVID wards	
Managing a well-being cafe for hospital staff	
Setting up and running food stores for staff (gifts) Compiling comfort bags from gifts Manning a covid absence help line Tap turning in empty wards	

Table 1: Summary of comments that medical librarians submitted regarding new tasks performed during these pandemic months. Some of the tasks were divided into duties solely related to the pandemic and duties that could be performed in the future as well (Personini, 2021).

8.4   Change in daily tasks for clinical librarians

8.4.1 New tasks

As with the responses reported by medical librarians, the percentage of clinical librarians who encountered new tasks was fairly similar: 45% of the respondent performed new duties *(Table 24).*

8.4.2 Domain of expertise

Of these duties, 73% were indicated as present in the clinical librarian's study responsibilities, therefore not effectively counted as a new task to be learned but simply as a change in priority in the activities that needed to be done. For example, clinical librarian Brbre had to spend more time researching documents and pre-print publications *(Table 23).*

8.4.3 Permanence of tasks at the end of the pandemic

The majority of clinical librarians (60%) stated that these new tasks were to be maintained even at the end of the pandemic. Among the tasks that would not be retained were, for example, the previously mentioned support in the administration of medical materials or vaccination processes *(Table 25).*
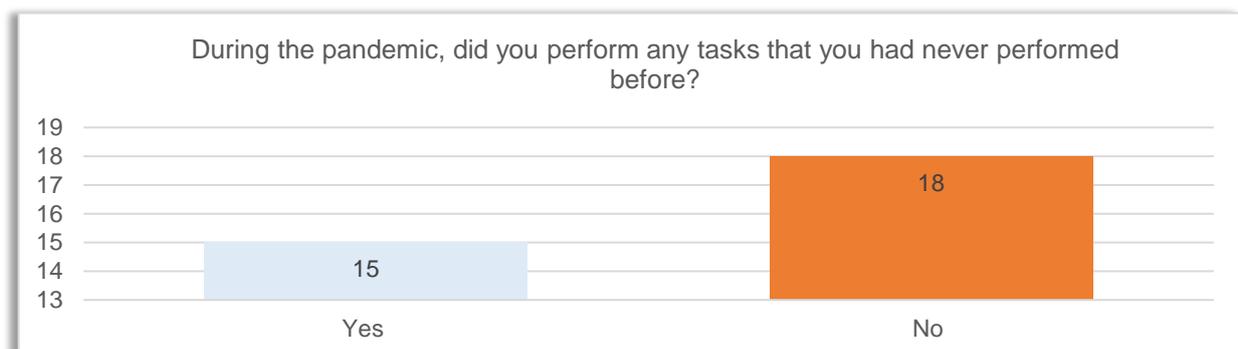
Figure 22: Emergence of new tasks for clinical librarians (Personini, 2021)
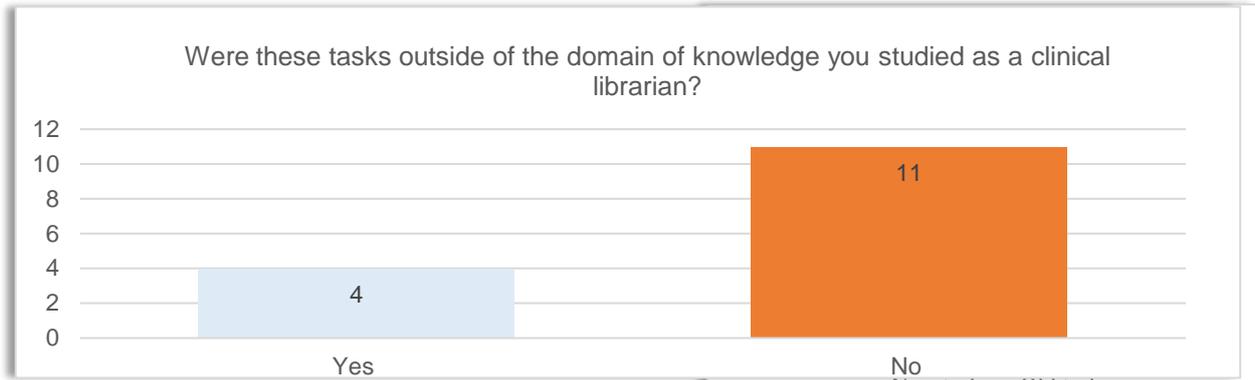
Figure 23: Tasks outside the area of expertise for clinical librarians (Personini, 2021)
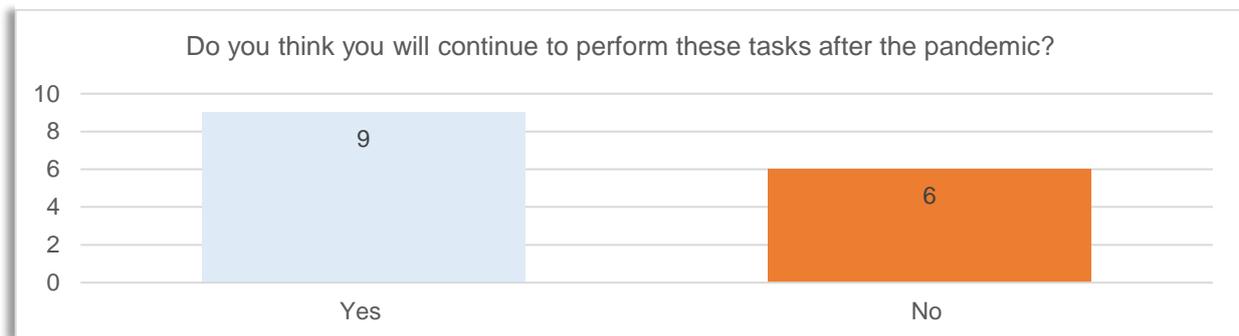
Figure 24: Tasks that will be maintained at the end of the pandemic for clinical librarians (Personini, 2021)

8.4.4 Tasks that met both requirements
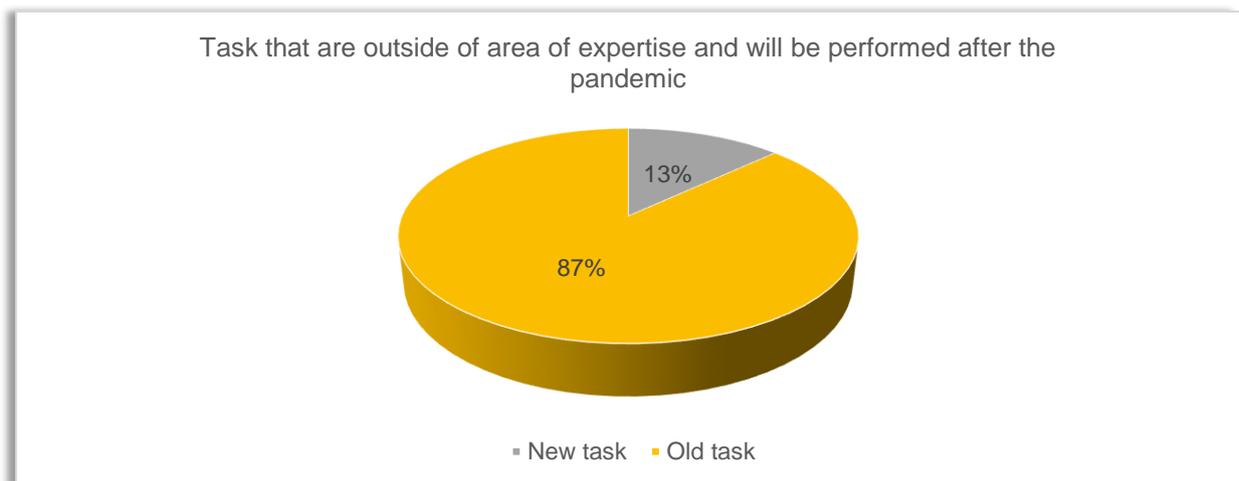
Figure 25: Assessment of new tasks for clinical librarians (Personini, 2021)

As a final aspect, in order to proceed with the actual counting of new duties which would be kept outside of the pandemic, the data from the above two charts were correlated, resulting in the creation of the following summary graph: **Only 6% of the tasks passed both filters placed by the survey author**. This meant that, in the remaining 94% of ca-

ses, these new tasks that were performed were either destined to no longer be performed at the end of the coronavirus-related crisis or were new tasks but still within the clinical librarian study area.

Tasks related to the emergency	Tasks that would be performed outside of the emergency
I was redeployed within the NHS, to fit mask testing and lateral flow testing distribution	Trawling for grey literature, blogs, news and pre-prints (with strong warnings!) to provide news updates
I was redeployed to assist in staffing problems – in addition to my work as a librarian	Communicating staff well-being promotion strategies
Wipe tables and chairs twice a day and support staff working from home	
COVID-specific evidence updates	
I joined a national group of clinical librarians and peer-reviewed literature searches for a national database of COVID-19 related literature searches.	

Table 2: Summary of comments that clinical librarians submitted regarding new tasks performed during these pandemic months. The tasks were divided into duties solely related to the pandemic and duties that could be performed in the future as well (Personini, 2021).

8.5   Evaluation of the hypothesis

Both clinical and medical librarians encountered new tasks during the pandemic.

Medical librarians had slightly higher percentages (12%) compared to the 6% of clinical librarians.

The reason for this majority of new duties on the part of medical librarians was, according to the author of this thesis, related to the greater general flexibility in the role of clinical librarians. In fact, in their embedded roles, they are, on the one hand, more accustomed to performing a varied number of tasks, and, on the other hand, it is a profession that lends itself to change according to the needs of the staff to which they are affiliated and therefore more prone to new tasks. These tasks consequently did not arise during the pandemic.

In addition, one of the significant changes in this pandemic has been related to the variation in sources used, moving from peer-reviewed journals to pre-print and to systematic reviews to living or rapid reviews. These sources and duties are traditionally more related to medical librarians.

For this reason, the hypothesis formulated by the author of the thesis could only be partially confirmed. This was because it is true that, for the majority of librarians, no new tasks arose, but there remained a minority who had to evolve their way of working. This minority, as demonstrated in the previous chapter, was confident that several of these tasks would be maintained after the end of the pandemic.

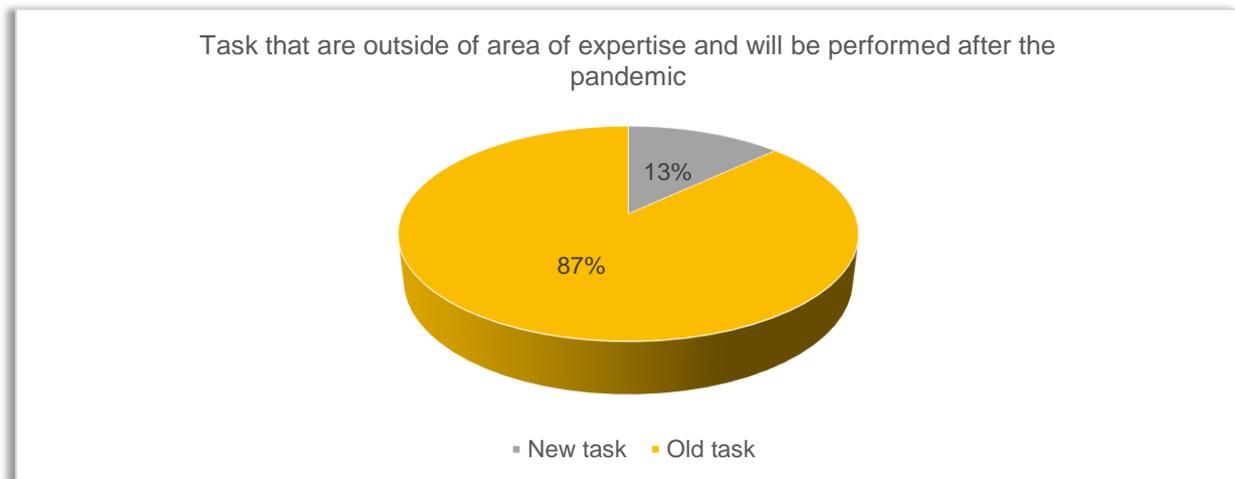A general chart is presented below showing the occurrence of new tasks for both categories together:

Figure 26: Assessment of new tasks for medical and clinical librarians (Personini, 2021)

8.6   Evolution of the concept of medical and clinical librarianship

This subchapter presents information that used the survey responses to assess librarians' perceptions of their work during the pandemic, capturing insights for future improvements.

Of the librarians who responded to the survey, 70% did not feel that their daily work had radically changed during the pandemic. The 30% of librarians who responded instead that their work had changed were asked if they thought their day-to-day activities would return to being the same after the pandemic. This question was posed along the lines of the previous chapter in order to determine whether the work would return to being the same at the end of the pandemic or whether the new duties would remain for years to come. Of librarians that considered the work to be different, 83% believed that their work and duties would not return to what they were before the COVID-19 pandemic (Tables 28 and 29).
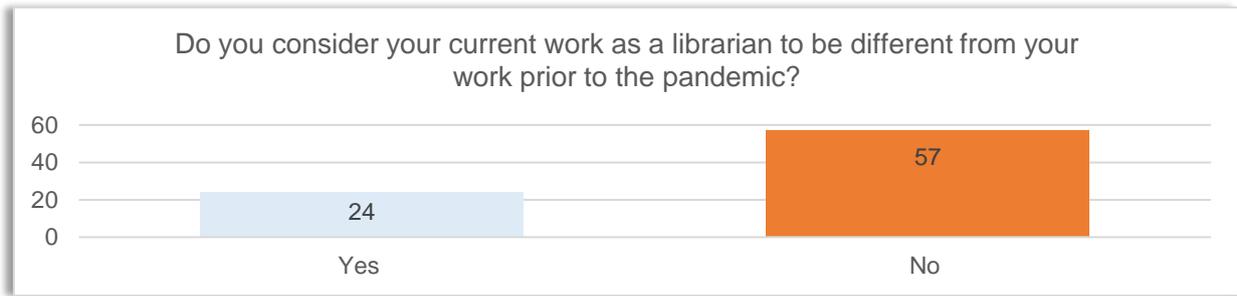
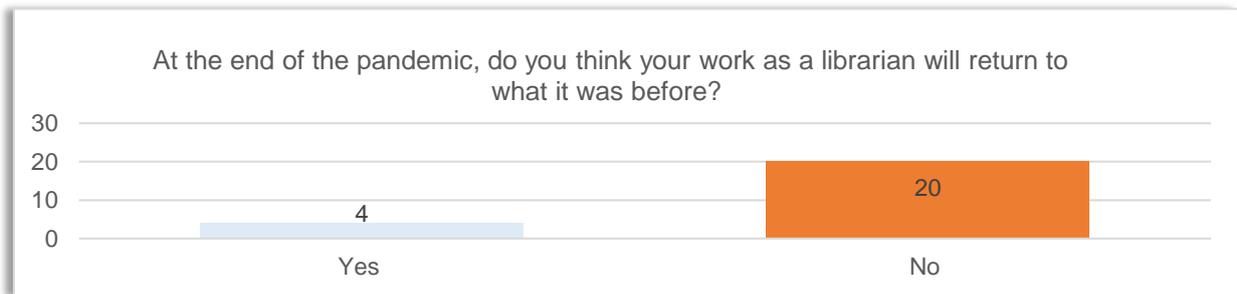Figure 27: Perceptions of the work performed and change in tasks (Personini, 2021).

Figure 28: Perceptions about the evolution of the profession (Personini, 2021).

Online work	Supply of information
I think there will be more virtual work going forward. It will take time to integrate into my teams again	We are moving towards a digital first strategy and moving away from hard copy books. We have moved most of our procedures online – eg online membership forms
Much of my work, for example, delivering training has moved online, and this will continue. My sessions have been adapted accordingly to incorporate more interaction and a blended approach. I feel my work needs to be at a higher intellectual level than previously….	Digital literacy support for clinicians will be more dominant
Skype or Zoom or Microsoft Teams used for meeting and training sessions	We will want to keep offering a database for rapid reviews
Thankfully, the pandemic has forced the institution in which I work to adopt technologies such as teams and increased online/remote learning. I hope that we can continue this as an offer in addition to in-person training, as it was already on our to do list but the obstructions we were facing have largely evaporated.	The demands of our users have increased and exploded; the job is much harder now, with more registries and databases to search, new methods and new methods to teach online

Table 3: The two main reasons for the belief that the work would not return to what they were before the COVID-19 pandemic (Personini, 2021).

The librarians were then asked if they felt that what they had done thus far had been sufficient to support the medical environment or if a further evolution of the profession was necessary. Of the librarians, 68% were positive about what had been done thus far and did not feel that a major change in the way of working was necessary at the moment.
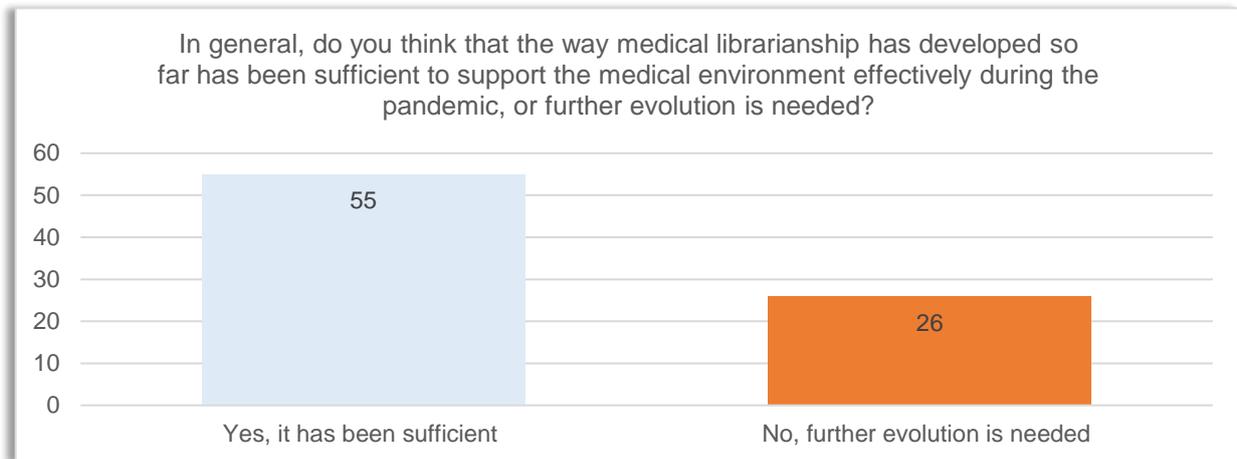

Figure 29: Assessment of the contribution made by librarians in the COVID-19 pandemic (Personini, 2021)

Among the primary motivations of the 32% who expressed support for the evolution of the concept of clinical and medical librarianship, there was a greater demand for recognition by the organisations with which the librarians collaborated and an evolution of the way research and information were gathered.

International recognition	Research methods and use of information
You can always promote yourself more effectively. I would love to see librarians being seen as egg essential to teams as physiotherapists and employed in similar numbers. We're a way off yet!	I think medical librarians need more training in evaluating and finding pre-print articles and in summarising findings, conclusions, recommendations to clinical colleagues. Evaluating articles will be a core skill and developing area.
We need better marketing – lots of times where our expertise would be useful, but staff aren't aware. Difficult during a pandemic when it is hard to justify a physical presence for outreach!	The needs, technology, service requirements etc. are always changing, and COVID-19 saw a dramatic change in how librarians and their clients work and how services could and need to be delivered. This will need to continue to evolve as work needs change.
The hospital doesn't think we're important. Many staff or patients don't know about us. Our profession was sufficient to support, but we needed leaders on board to understand what we can offer.	It has been mostly sufficient, however, there are always improvements to be made – use of resources, access to resources and evidence, additional document review and synthesising etc. Taking advantage of technological developments.

Table 4: Primary motivations for the evolution of the concept of clinical and medical librarianship (Personini, 2021).

9   Conclusions

This paper provides a summary of how librarians have assisted the medical community and society during the current pandemic, with all the changes in daily duties that have occurred.

Using the results of the survey, the interviews and the literature, it is possible for the author of this thesis to draw the following initial conclusions: the support provided by librarians in certain geographical areas during the COVID-19 pandemic has been enormous and frequently of vital importance. Due to the large amount of information and limited medical evidence available at the beginning of the pandemic, librarians were able to modify their approach to the literature, adapting to working with pre-prints and doing what they could to speed up searches for medical teams through research banks. The major change is to no longer work on conditions that need to be evaluated over the long term, but on patients who need to be treated immediately.

In addition to this, librarians provided current information to the population in an accurate and professional manner, thus supporting the decisions made by governments and indirectly limiting the spread of new infections.

Even databases have not been immune to the change and the wave of publications to be processed: to overcome the problem of information initially written in Chinese and the constant production of new articles and trials, databases created internal libraries with the aim of accumulating all documents considered to be valid. These databases were used for review production and made freely accessible to the public.

From the outcomes of the interviews and the survey, it is possible to draw hints for future improvements: among the major issues highlighted was the need for greater cooperation between organisations and, in certain cases, greater recognition of the medical and clinical librarian professions. In fact, as it can be seen from the comments and results of the survey, librarians are not used and integrated in the same way by the various medical teams: in some cases, they play leading roles in the search for information, while in others they have been relegated to secondary tasks such as cleaning and contact tracing.

According to the author of the paper this problem is directly related to the presence and evolution of the medical and clinical librarianship concept to a high degree only in certain geographical areas of the world. If there were clinical and medical librarians in all countries, the entire medical community would be aware of the advantages that this collaboration has to offer. A first step toward the future would therefore be to continue the development of this profession all around the world.

Another aspect that is not simple to evaluate is the actual duration of the pandemic: SARS and MERS lasted only three to six months; therefore, in those cases, it was acceptable for each organisation to work on its own, as it does not make sense to invest large resources for an event destined to end after a short time and for which the contribution of individual organisations is sufficient. However, since the COVID pandemic lasted over several months, this caused duplication of the work done by individual librarians and database providers. In this case, the author of the thesis agrees with Brbre's suggestion that the creation and updating of protocols for responding to future pandemics would allow for a coordinated response both at the level of individual librarians and at the level of international organisations.

A final criticism highlighted by librarians is the changes necessitated by online work. On the one hand, this brings benefits, making working hours more flexible and allowing for greater international cooperation. On the other hand, for those who have families and children, it makes it difficult to maintain stable working hours. At the end of the pandemic, it will therefore be of fundamental importance to analyse all these aspects, evaluating the pros and cons of the case to ensure to allow the profession to evolve further. In this case, it is important to note that many librarians have adapted their lessons to be conducted online, emphasizing the positive aspects.

An aspect that would have been interesting to investigate and that has not been possible to evaluate is the perception of this collaboration by the counterpart of librarians: the medical staff. In this way it would have been possible to evaluate which tasks and services performed by librarians are considered most valuable, and which aspects physicians consider most important. Unfortunately, due to time constraints, it was not possible to explore this area, making it a missing part of the paper, since it evaluates collaboration solely from the perspective of the librarians.

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11 Attachments

11.1 Survey

The role of librarians in the covid-19 pandemic

Good morning! My name is Leonardo Personini. I am a student at the University of Information Science in Coira, and I am writing a paper on the role of academic libraries and medical librarians in the fight against the COVID-19 pandemic. These questions are intended to get an idea about the daily duties of amedical librarian, the databases they utilize to gather information, and whether any new duties have arisen for them during these difficult times.

There are 31 questions in this survey.

Support decision-making and public information

The purpose of these questions is to assess how medical librarians have supported political decisions andhelped to circulate information in the public interest.

During this pandemic, have you ever used the library website or other media to share information and raise public awareness (for example, about protective measures, advices on how to avoid misinformation, etc.)?

Please choose **only one** of the following:
○ Yes
○ No
○ I am not currently affiliated with a library

What kind of information did you help disseminate?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '1 [B1]' (During this pandemic, have you ever used thelibrary website or other media to share information and raise public awareness (for example, about protective measures, advices on how to avoid misinformation, etc.)?)

Please choose **all** that apply:
☐ Information about preventive measures
☐ Information about the status of the pandemic
☐ Information related to library use

☐ Advice on how to avoid misinformation
☐ Other:

How many questions has the library received from the public concerning the status of the pandemic, possible protective measures, or other COVID-19 related topics?

Only answer this question if the following conditions are met: Answer was 'No' *or* 'Yes' at question '1 [B1]' (During this pandemic, have you ever used the library website or other media to share information and raise public awareness (for example, about protective measures, advices on how to avoid misinformation, etc.)?)

Please choose **only one** of the following:
○ 0–10 questions
○ 11–20 questions
○ 21–30 questions
○ more than 30 questions

Do you think the resources available to the library to contribute to public information dissemination were sufficient?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '1 [B1]' (During this pandemic, have you ever used the library website or other media to share information and raise public awareness (for example, about protective measures, advices on how to avoid misinformation, etc.)?)

Please choose **only one** of the following:
○ Yes
○ No (please specify why)

Questions about databases used for informationresearch and reviews

The purpose of these questions is to determine which databases are used to search for information, and what is the perception of systematic reviews of articles and publications.

Have you ever contributed to creating a systematic review about a COVID-19 related subject? If yes, can you please specify which institution(s) the reviews were for?

Please choose **only one** of the following:

○ Yes (please specify institution(s))

○ No

What database do you use to search for information when answering questions and gathering data for doctors and the medical field?

Please choose **all** that apply:

☐ Cochrane

☐ Embase

☐ Medline

☐ MedRxiv

☐ World Health Organization Global research database

☐ Other:

Do you think the reviews provided by Cochrane (or systematic reviews, in general) are avalid support for doctors and researchers during this pandemic?

Please choose **only one** of the following:

○ Yes

○ No (please specify why)

Do you think the current databases have been able to effectively cover the information needs of doctors? If not, can you please specify why?

Please choose **only one** of the following:

○ Yes

○ No (please specify why)

What do you feel is the most valuable and complete database in providing COVID-19 related information?

Please choose **only one** of the following:

○ Cochrane

○ Embase

○ Medline

○ MedRxiv

○ World Health Organization Global research database

○ Others (please specify)

Questions about the daily activities performed by clinical and medical librarians

These questions are intended to determine the main tasks of librarians during the COVID-19 pandemic. It will be possible to differentiate the tasks according to whether you are a clinical librarian (i.e. tasks related to supporting doctors in their daily activities) or a medical librarian (i.e. tasks related to analysis and review of information).

Are you a clinical librarian?

Please choose **only one** of the following:

○ Yes

○ No

Are you a medical librarian?

Please choose **only one** of the following:

○ Yes

○ No

During the pandemic, which activity took up the major part of your time working as a clinical librarian?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '10 [D3]' (Are you a clinical librarian?)

Please choose **only one** of the following:
○ Case rounds with doctors
○ Researching for information
○ Teaching information-gathering techniques
○ Disseminating information to the public
○ Collaboration in systematic reviews
○ Other (please specify)

Have you ever actively participated in practical activities for patient care (for example, support in mechanical ventilation practices, medication administration, etc.)?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '10 [D3]' (Are you a clinical librarian?)

Please choose **only one** of the following:
○ Yes
○ No

Which activity did you perform?

Only answer this question if the following conditions are met: Answer was 'Yes ' at question '13 [D4]' (Have you ever actively participated in practical activities for patient care (for example, support in mechanical ventilation practices, medication administration, etc.)?)

Please choose **only one** of the following:
○ Support in patient ventilation practices
○ Support in medication administration practices
○ Others (please specify)

During the COVID-19 pandemic, there is an explosion of publications and articles toevaluate and review. Have you ever faced this issue before?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '11 [D2]' (Are you a medical librarian?)

Please choose **only one** of the following:

○ Yes

○ No

What type of documents did you use most to perform analyses and write reviews?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '11 [D2]' (Are you a medical librarian?)

Please choose **only one** of the following:

○ Journal article

○ Trial registry record

○ Preprint article

○ Other (please specify)

During the pandemic, did you perform any tasks that you had never performed before?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '10 [D3]' (Are you a clinical librarian?)

Please choose **only one** of the following:

○ Yes

○ No

During the pandemic, did you perform any tasks that you had never performed before?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '11 [D2]' (Are you a medical librarian?)

Please choose **only one** of the following:

○ Yes

○ No

Were these tasks outside of the domain of knowledge you studied as a clinical librarian? If yes, can you please specify which task?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '17 [D7]' (During the pandemic, did you perform any tasksthat you had never performed before?)

Please choose **only one** of the following:
○ Yes (please specify the task(s))
○ No

Were these tasks outside of the domain of knowledge you studied as a medical librarian? If yes, can you please specify which task?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '18 [D8]' (During the pandemic, did you perform any tasksthat you had never performed before?)

Please choose **only one** of the following:
○ Yes (please specify the task(s))
○ No

Do you think you will continue to perform these tasks after the pandemic?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '17 [D7]' (During the pandemic, did you perform any tasks that you had never performed before?)

Please choose **only one** of the following:
○ Yes
○ No

Do you think you will continue to perform these tasks afterthe pandemic?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '18 [D8]' (During the pandemic, did you perform any tasks that you had never performed before?)

Please choose **only one** of the following:

○ Yes

○ No

Questions about the evolution of the concept of medical librarianship

These questions will assess whether medical and clinical librarianship development and related developments todate have been sufficient in fulfilling the needs of the medical world.

Of the following three areas of expertise, which do you feel has been the most important in addressing the current pandemic?

Please choose **only one** of the following:

○ Public information

○ Document review and abstracting

○ Supporting clinicians in their daily activities by providing information

In general, do you think that the way medical librarianship has developed so far has been sufficient to support the medical environment effectively during the pandemic, or further evolution is needed?

Please choose **only one** of the following:

○ Yes, it has been sufficient

○ No, further evolution is needed (please specify in which way)

Do you consider your current work as a librarian to be different from your work prior to the pandemic?

Please choose **only one** of the following:

○ Yes

○ No

At the end of the pandemic, do you think your work as a librarian will return to what it was before?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '25 [E6]' (Do you consider your current work as a librarianto be different from your work prior to the pandemic?)

Please choose **only one** of the following:

○ Yes

○ No (please specify why)

What do you think has been the most important contribution of medical librarians to this pandemic?

Please write your answer here:

Demographic questions

The purpose of these questions is to geographically and demographically delineate the survey participants. It is not mandatory to answer these questions. If you do not wish to answer, you may click "no answer".

In which continent do you currently work as a medical librarian?

Please choose **only one** of the following:

○ Europe

○ North America

○ South America

○ Asia

○ Oceania

○ Africa

How long have you been working as a medical librarian?

Please choose **only one** of the following:

○ 1–5 years

○ 6–10 years

○ 11–20 years

○ more than 20 years

Your age

Please choose **only one** of the following:

○ 18–30 years

○ 31–40 years

○ 41–50 years

○ 51–60 years

○ above 61 years

Your gender

Please choose **only one** of the following:

○ Female

○ Male

Thank you for taking the time to complete this survey

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Die Informationswissenschaft ist in der Schweiz noch ein relativ junger Lehr- und Forschungsbereich. International weist diese Disziplin aber vor allem im anglo-amerikanischen Bereich eine jahrzehntelange Tradition auf. Die klassischen Bezeichnungen dort sind Information Science, Library Science oder Information Studies. Die Grundfragestellung der Informationswissenschaft liegt in der Betrachtung der Rolle und des Umgangs mit Information in allen ihren Ausprägungen und Medien sowohl in Wirtschaft und Gesellschaft. Die Informationswissenschaft wird in Chur integriert betrachtet.

Diese Sicht umfasst nicht nur die Teildisziplinen Bibliothekswissenschaft, Archivwissenschaft und Dokumentationswissenschaft. Auch neue Entwicklungen im Bereich Medienwirtschaft, Informations- und Wissensmanagement und Big Data werden gezielt aufgegriffen und im Lehr- und Forschungsprogramm berücksichtigt.

Der Studiengang Informationswissenschaft wird seit 1998 als Vollzeitstudiengang in Chur angeboten und seit 2002 als Teilzeit-Studiengang in Zürich. Seit 2010 rundet der Master of Science in Business Administration das Lehrangebot ab.

Der Arbeitsbereich Informationswissenschaft vereinigt Cluster von Forschungs-, Entwicklungs- und Dienstleistungspotenzialen in unterschiedlichen Kompetenzzentren:

- Information Management & Competitive Intelligence
- Collaborative Knowledge Management
- Information and Data Management
- Records Management
- Library Consulting
- Information Laboratory
- Digital Education

Diese Kompetenzzentren werden im Swiss Institute for Information Science (SII) zusammengefasst.

Impressum

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