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The Influence of Medical Leadership and Non-Medical Leadership in Hospitals' Performance: A Systematized Review

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Abbreviations and Acronyms:

ACO: Accountable Care Organizations; CEO: Chief Executive Officers; ICT: Information and Communications Technology; IHQ: Index of Hospital Quality; NHS: National Health Service; ROA: Return on Assets; SDG: Sustainable Development Goals; UHC: Universal Health Coverage; UK: United Kingdom; US: United States of America; USNWR: U.S. News and World Report; VA: Veterans Affairs; WHO: World Health Organization

1. Abstract

1.1. Introduction: managers play an important role in guaranteeing that firms operate efficiently and reach their goals. Hospital managers are no different, regardless of whether the hospital is a for-profit or a nonprofit organization. In western countries in the past, hospitals were routinely led by doctors. That has changed and now in the US and UK, for instance, most of the hospitals are run by professional, non-physician managers. Who is most qualified to run a healthcare organization is a topic of frequent discussion. This systematic review was conducted to answer whether a manager with a medical background, who has received patient care training and is, therefore, best able to understand the organization's needs for quality of care, is the most suitable leader, or is it the manager with managerial training, who is most cognizant of the organization's financial needs?

1.2. Methods: A systematized, retrospective, analytical, exploratory literature study. The study population is composed of the current literature that clarifies the research question and The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA 2020) statement was used as guidance and to provide additional details about the process of the review. A thematic method was used to analyze and synthesize the selected papers after eligible articles were chosen using pre-defined inclusion criteria.

1.3. Findings: A total of 8128 articles were identified and 6 met the eligibility and were included in this review. The results show a positive correlation between the hospital performance and medical manager in the ranking of the hospitals and the quality of health care provided. Whereas, the financial performance was less significant in both cohorts.

1.4. Conclusions: Although there are many papers assessing the influence of medical leadership and non-medical leadership in hospitals' performance, the evidence extracted is of different variables and a lot of confounding factors could play a role in the conclusion that has been reached, and therefore more studies with control groups are required so the results will be valid for comparison.

2. Introduction

According to the Britannica encyclopedia, a hospital is "an institution that is built, staffed, and equipped for the diagnosis of disease; for the treatment, both medical and surgical, of the sick and the injured; and for their housing during this process. The modern hospital also often serves as a center for investigation and teaching" [1]. The hospital is a complex entity and modern technology has increased the range of available diagnoses and treatments, and staff with higher levels of training is required due to the greater variety of services that have more cutting-edge procedures and treatment availability. Also, a wide variety of new treatments and tools have been created as a result of connecting medical research, engineering, and biotechnology; many of these require specialized knowledge and resources to use. Additionally, hospitals are repositories of vital information and resources. They can be categorized based on the interventions they carry out, the roles they play in the healthcare system, and the health and educational services they provide to the local communities. Hospitals frequently serve as the community's focal point for health care and set the bar high for sustainable growth, the improvement of health systems, and the creation of wholesome neighborhoods. Furthermore, effective hospitals continually look for new ways to support care outside of their walls to ensure that patients can receive care closer to their homes, within their communities, and at a sustainable cost. As a result, the operation cost of the hospitals has increased and managers of health services are increasingly concerned with issues relating to quality, cost, effectiveness, and efficiency [2].

Health care is always changing, and occasionally changes come about very quickly. The financial aspect of care delivery may be directly impacted by these changes. Accordingly, Health care professionals are paying close attention to where healthcare finance has come from and is going to make sure that these changes don't have a negative impact on a facility's bottom line. This includes analyzing historical, current, and projected financial hospital trends [3]. There are many different methods for financing hospitals because they may cater to particular populations and may be for-profit or not-for-profit institutions. Government contributions almost always cover at least a portion of the cost of building a hospital. However, there are various ways to cover operating costs. For instance, money may come from private endowments or gifts, general government funds, money collected from insurance subscribers, or a combination of these. Operating costs in some nations may be partially offset by public or private funding sources that cover fees for patients who lack insurance or have insufficient coverage, as well as by patients' out-of-pocket expenses [4].

The strategic apex is the highest level of management in a healthcare organization, responsible for setting the organization's overall strategy and direction. It is typically made up of top executives such as the CEO, COO, and other senior leaders. Also, the strategic apex is responsible for making key decisions that guide the organization's operations, such as setting long-term goals and objectives, allocating resources, and developing policies and procedures. They also oversee the organization's performance and ensure that it is meeting its strategic goals. In a healthcare organization, it plays a critical role in navigating the rapidly changing healthcare landscape, which includes regulatory changes, technological advancements, and shifting patient needs and expectations. They must be able to anticipate and respond to these changes while ensuring that the organization remains financially sustainable and able to deliver high-quality patient care.

Overseeing mission achievement, financial performance, quality of care and executives' performance are the responsibilities of the hospital board of directors. The board of directors is made up of experts in their respective fields. Hospitals with religious affiliations frequently have clergy members on their boards of directors. University faculty members from the medical school are frequently found in teaching hospitals they are affiliated with. Boards of directors play an important role in guaranteeing that firms operate efficiently and reach their goals. Hospital boards are no different, regardless of whether the hospital is a for-profit or a nonprofit organization. Also, among other tasks, the board of directors participates in long-term strategic decisions, such as investments in infrastructure and technology [5]. Executives in the hospital leadership hierarchy are in charge of leading the business strategy, managing the company, and making financial decisions. Medical and health services managers may oversee entire practices or clinical areas [6]. A study [7] looked at whether 142 non-profit hospitals in the USA that did not have medicals on their boards of directors provided care of lower quality, and according to the study, boards lacking medical members were linked to a three to five-percentage-point drop in the standard of treatment for heart failure, pneumonia, and surgical infection prevention.

Long ago in western countries, hospitals were routinely led by doctors but now that has changed, In US and UK, for instance, most of the hospitals are run by professional, non-physician managers [8]. This practice has helped the health system in these countries to become one of the top-ranked in the world [9] and for the business of health to thrive beyond the simple task of providing treatment to the sick. Therefore, increasing physician engagement in leadership is seen as a factor that may help to enhance organizational performance in the UK National Health Service (NHS), where doctors hold positions of power within healthcare organizations that allow them to participate in managerial decisions [10]. Bottom-up leadership, stronger political influence, and enhanced communication between doctors and senior management may be advantages of hiring doctors in healthcare administration jobs [11]. The current emphasis on involving doctors in leadership entrées efforts to link clinical decisions with those of strategic management, and it has expanded to include essential accountability for the quality of care as well as resource management [12]. However, clinical leadership

is crucial for involving other staff members as well as for gaining public support. According to Lord Hunt: "Good clinical leadership is central to the delivery of the NHS plan. We need leaders who are willing to embrace and drive through the radical transformation of services that the NHS requires. Leaders are people who make things happen in ways that command the confidence of local staff. They are people who lead clinical teams, people who lead service networks, people who lead partnerships, and people who lead organizations" [10]. Previous studies indicated no performance differences between medical and non-medical managers [13-15]; however, there is a widespread and intense dispute as to which profession should manage hospitals. There appears to be a belief that the mindset of a doctor varies from that of a general healthcare manager [16,17]. Papers arguing against medical leadership cite doctors' over-identification with their professional clinical role, their tendency to be conservative individualists rather than team players, their lack of formal management training, and their alleged weaknesses in financial management and organizational strategy [18-21]. Doctors, on the other hand, prefer to be led by doctors [10]. Accordingly, the influence of medical leadership and non-medical leadership in hospitals' performance has not been studied or reviewed particularly for the leadership and management structures of modern healthcare systems which indicated that. Conducting a systematized review of the influence of medical leadership and non-medical leadership in hospitals' performance is important to help stakeholders to take strategic decisions towards human resources for health to have a well-functioning health system that effectively addresses the needs of the population's health to achieve the Sustainable Development Goals SDG 3 which is "Ensure healthy lives and promote well-being for all" [22]. This study focused on three themes; the performance, the impact of training and the level of healthcare quality in hospitals that have medical leadership and hospitals that have non-medical leadership, thereby, answering the following question: What is the influence of medical leadership and non-medical leadership on hospitals' performance?

3. Materials and Methods

A systematized qualitative retrospective exploratory analytical study. The systematized review [23] in this paper as it "Attempts to include elements of systematic review process while stopping short of a systematic review". The systematized review neglects the comprehensiveness of systematic reviews; however, the search phase is regarded as one of the main parts of systematicity. The study population was composed of the current literature that clarifies the research question.

3.1. Data Collection Method and Plan for Data Analysis

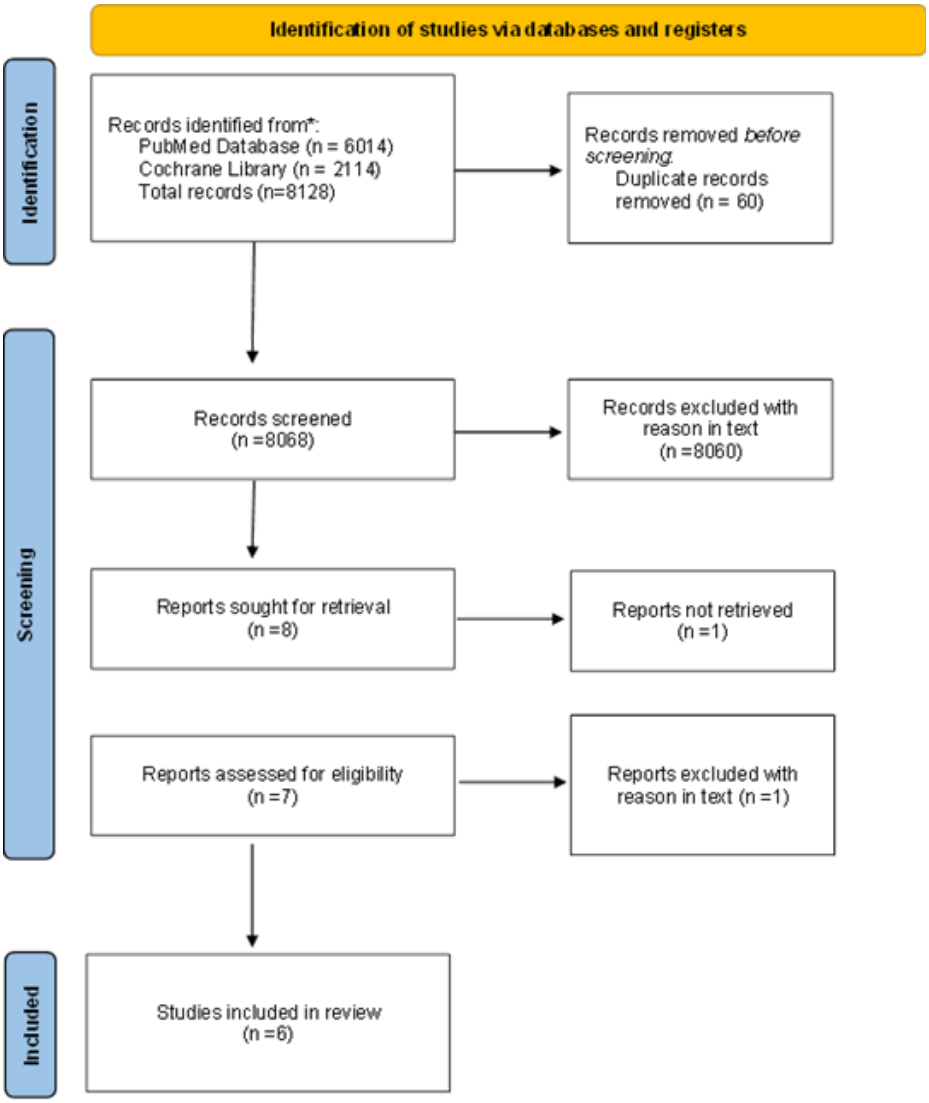
Data was collected through a systematic approach to review the current literature which answers the research question and fulfills the study objectives. The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA 2020) statement [24] was used as guidance and to provide additional details about the process of the review. The PRISMA guideline is a set of standards developed to improve the transparency and completeness of reporting in systematic reviews. It consists of a 27-item checklist, an abstract checklist, and a three-phase flow diagram. The guideline was designed mainly for systematic reviews of studies reviewing health interventions, nonetheless, the checklist items are flexible enough to be used in papers reviewing other interventions [24]. The checklist addresses the title, abstract, introduction, methods, results, and discussion sections of a review report as well as other information such as the registration of the review and protocol.

The flow diagram presents the number of identified, included, and excluded studies. The process starts with [1] Identification of the studies searched through databases, then the [2] Screening phase where studies are assessed based on their title and abstract to determine their relevance, followed by reading the full text of the studies that meet the inclusion criteria to determine if they are eligible for inclusion in the review. The final phase is where the number of [3] Included studies are present and this step involves synthesizing the data from the eligible studies and presenting the findings clearly and transparently [25].

Table 1: Search strategies and databases

Database		Strategy	Result
PubMed	#1	((executive* OR leader* OR leadership* OR manager* OR director*) AND (physician* OR doctor* OR clinician*)).	56733
	#2	Add custom filter: Performance	9558
	#3	Limit to: Publication date (2011-2021)	6147
	#4	Limit to: English	6014
Cochrane library	#1	(Executive OR leader OR leadership OR manager OR director) AND (physician OR Doctor OR clinician)	2582
	#2	Limit to: English and Publication date (2011-2021)	2114
Total Articles		PubMed #4 + Cochrane Library #2	8128

Figure 1: PRISMA 2020 flow diagram



Result of Data Extraction

3.2. Search and Selection of Articles

In this review, all published studies were identified by searching in the academic electronic database PubMed and Cochrane library. The last search was run on the 10th of March 2023. The development of a search strategy is an essential part of any systematic review as it starts with examining the main concepts being reviewed and allows the readers to replicate and assess the completeness and comprehensiveness of the search. In this review, the search strategy was designed to encompass both the leadership role and the role of the medical professional. Terms describing each role were linked together using the Boolean operator OR and an asterisk at the end of the term to maximize the search scope [26,27]. Both roles were then linked together using AND operator to ensure the retrieval of all articles containing or representing both roles [27]. The search string was as follows: ((executive* OR leader* OR leadership* OR manager* OR director*) AND (physician* OR doctor* OR clinician*)). In PubMed and Cochrane library, the search string was applied using the advanced search.

3.3. Inclusion Criteria

To include articles in this review, inclusion criteria were specified and followed to identify the eligibility of the paper. The criteria for inclusion were that the articles:

a) has one of the search terms in the title or abstract.

b) were published in English.

c) were primary, cross-sectional studies, on senior managers of healthcare organizations that include managers who are also doctors, and managers who are non-doctors. The second group could include those with a clinical background other than medicine (nurses, CHWs, dentists, etc.) and those with other professional backgrounds.

d) were published between 2011 and 2021.

e) could be found in full-text.

3.4. Study Selection

Search results were imported into the Rayyan tool [28] to screen the articles and detect duplication. This tool is designed to assist

researchers with the process of conducting systematic reviews by providing a platform for researchers to collaborate on the review process, manage references, and streamline the screening process. Based on the inclusion criteria, screening and eligibility assessments were done in order. The articles were screened based on their title and abstract, and their eligibility was determined after reviewing the full-text publication. An overview of the study selection procedure may be seen in the results chapter in the PRISMA flow diagram.

3.5. Data Extraction

To extract data, data extraction forms had been designed to obtain information vital to the research question from the included studies. A data extraction form adapted from a data extraction form by the Cochrane collaboration, the form includes general information about the study and data relevant to research objectives that answer the research question, the data is extracted manually and described as stated in reports. The following strategy was used to extract data, we extracted from each study separately and then collated, summarized, and tabulated them [29,30].

3.6. Analysis Stage

We analyzed the extracted data manually, using thematic analysis which is "a method for identifying, analyzing and reporting patterns within data", thematic analysis is an initial and simple method of analysis. The goal of thematic analysis is to identify themes, which are patterns in the relevant and important data, then use these themes to address the research question. thematic analysis is not about summarizing data, it interprets and makes sense of them [31]. To use thematic analysis, we attribute a qualitative thematic description to all data in the selected studies as codes and build up themes out of these codes. In this study key themes were derived to analyze data more conveniently to answer the research question.

4. Results

4.1. Result of Study Selection and Screening

The search resulted in n = 8,128 articles published between 2011 and 2021. A total of 60 duplicates were removed manually with the help of the Rayyan tool. A total of 8068 articles were screened based on title and abstract. The screening process resulted in the removal of n=8060 as a result of the inclusion criteria – 10 articles were excluded for not being a cross-sectional study, 1 article was removed because it did not use doctors and non-doctors as population, and the rest (n=8049) were removed for relevancy issues (search terms were not included in title or abstract OR they were off-topic)-leaving8 articles to be assessed for eligibility in the next step of the screening process. Eight articles were assessed for eligibility based on full-text review and this process resulted in one article being removed due to the specificity of the population (plastic surgeon as opposed to doctors in general), and one article being removed because it could not be retrieved in full-text, and therefore, the remaining 6 articles were analyzed and synthesized thematically.

4.2 Results of Data Extraction

This review includes papers that were published in the period from the beginning of 2011 till the end of 2021. Two papers from the USA, two papers from Europe: UK and Germany, a paper from Taiwan, and a paper targeting the Arab world. The included articles assessed different factors contributing to the performance of hospitals under different leadership characteristics. Quality of care was assessed in different ways such as by measuring health outcomes, patient safety, patient satisfaction, etc. In addition to that, the financial performance indicators of the health organization included revenue and profitability in addition to other indicators.

A paper by Goodall [32] published in 2011 assessed the top 100 hospitals in the USA in the three specialist fields of Cancer, Digestive Disorders, and Heart and Heart Surgery totaling three hundred healthcare executives. It used the US News and World Reports Best Hospitals (USNWR) 2009 classification as one of the most established rankings in the USA, which incorporate several empirical measures in its Index of Hospital Quality (IHQ). Additionally, the paper collected the data on each hospital's manager using hospitals' websites, and if not available, personal contact with institutions in the form of a request for the name of the CEO was done.

Goodall's paper investigated three areas of healthcare performance that are reflected within the IHQ quality scores: structure, process, and outcomes. Structure refers to the resourcing of patient care such as the number of nurses, available technologies, and patient services. Outcome measures the mortality rates 30 days after admission, while the process is about the delivery of care; it incorporates diagnosis, treatment, and prevention. the patient-safety index incorporates measures such as safety and freedom from accidental injury and the practice of up-to-date medical procedures.

Goodall's analysis found that in each of the three specialist fields, the mean IHQ score of hospitals where the Chief Executive Officer is a physician is greater than the mean score of the hospitals where the CEO is a professional manager. In-depth, the mean IHQ hospital-quality score of the Cancer hospitals led by physicians is 31.63 (SD = 16.29) while the mean quality score of Cancer hospitals led by non-physician managers is 23.61 (SD = 4.18). Moreover, the regression equations reveal that the presence of a medical manager is associated at the $p < 0.001$ level with an extra 8 to 9 hospital-quality points. Goodall concluded that her paper does not establish that physicians make more effective leaders when compared with professional managers, but it starts the empirical process. It finds - in each of three disciplinary fields - that hospitals positioned higher in the US News and World Reports Best Hospitals ranking are led disproportionately by physicians.

Another paper from the USA by Tasi et al [33] analyzing the impact of senior physician leadership on hospital performance - specifically, quality, operating efficiency, revenue, and profitability,

used the same ranking as Goodall, the USNWR 2015 rating system in addition to Medicare Cost Reports 2013/2014 and analyzed the 115 largest hospitals in the United States by staffed bed size including general medical/surgical beds and special care beds. Data on leadership positions were collected manually through available online resources or the hospital or health system Website or by contacting the institution directly. For each hospital, the highest governing body was identified, and the CEO of that organization was recorded, and in case the hospital was part of a larger healthcare network, the CEO of the healthcare network was recorded as the leader for that hospital. Quality data for each hospital were obtained from the USNWR 2015 rating system, which drew from a set of 4,716 facilities and rated hospitals by subspecialty quality from 0 to 100. On the other hand, financial data were taken from the 2013/2014 Medicare Cost Report, including gross patient revenue, non-patient revenue, and net income (AHD, 2015). The Medicare Cost Report was also used to identify the number of patient days for each hospital.

The article, using a Bivariate analysis, revealed that physician-led hospitals had significantly higher USNWR quality ratings in all specialties than did hospitals in manager-led networks by an average of 8.5 points ($p < .001$). Additionally, there were no differences in the number of staffed beds, inpatient days, total revenue, or profit margins between the two cohorts as well as physician-led hospitals had a higher average number of inpatient days per hospital bed (280.4) than did non-physician-led hospitals (259.5; $p = .02$).The paper concluded that when placed in the context of the value framework, their findings of higher quality ratings without a negative impact on financial performance suggest that a higher value of care is under physician CEOs.

Meanwhile, in the UK, a study by Veronesi et al [34] based on a secondary analysis of publicly accessible data from hospital trusts in the United Kingdom, hospitals headed by doctors outperform those led by lay managers. The study sample took into account 240 observation points from 2006 to 2009 and information was collected manually from websites and annual reports of each hospital. They gathered data on all of the board members, their qualifications, and job titles, and it included only hospitals which offered full information in terms of the membership of their board in each year under investigation. To assess the organizational performance, the rating on the quality of the service provided was used which comprised a quality score focusing on four main areas: Health and well-being, Clinical effectiveness, Safety and patient focus, and Ease and equity of access. An additional test measuring the quality related to patient morbidity (the hospital standardized mortality ratio) was used as well.

The data was collected over three years, and it suggests that even a small increase in the number of doctors on boards (10%) can have marked consequences for hospital-level outputs and outcomes. The results also suggest that clinical involvement can have a positive influence on performance. Additionally, Trusts achieving a four rating had an average of 15.01% of directors with a medical background, whereas in trusts achieving only one rating, 11.09% of board directors were doctors. The findings were confirmed in relation to lower morbidity rates, and tests to exclude the possibility of reverse causality, whereby doctors joined the boards of better-performing trusts. The paper confirmed that it is clinical involvement on boards that are contributing to performance. Furthermore, the paper suggests that the qualifications of the CEO may be less important than previously assumed but having a larger group of clinicians on boards collectively contributing to decision-making would make the difference.

In another part of the world, and specifically the Arab world, a paper by Fares Y. et al [35] analyzed a total of 283 hospitals ranked in the Arab World using the “Ranking Web of World Hospitals” by Cybermetrics Lab, 2017.Hospitals ranking between 1 and 50 were considered the top 50 hospitals, and those ranking between 234 and 283 were considered the bottom 50 hospitals. The names and addresses of the hospitals were collected from both national and international sources, including “Hospitals Worldwide,” among others. Data were collected on each hospital manager using hospitals’ websites and, if not available, personal contact with institutions in the form of a request for the name of the manager was done.

The assessment was done for hospital performance based on cybermetric indicators that are useful to evaluate science and technology metrics. These were assessed by exploring the hospital’s web domain including visibility, size, rich files, and scholar data. Visibility refers to the total number of unique external links received by a search engine, while the size is the number of pages recovered from search engines. Results are log normalized to 1 for the highest value and then combined to generate the rank. For assessing the rich files, evaluation of the relevance to academic and publication activities, and consideration of the volume of different file formats. For the scholar webometric, retrieval of the number of papers and citations for each academic domain using google scholar is done. These results from the Scholar database represent papers, reports, and other academic items.

This article found out that among the top 50 hospitals in the Arab World, 54% of the CEOs were physicians, whereas 46% of the CEOs were non-physician managers. whereas, Among the bottom 50 hospitals in the Arab World, 74% of the CEOs were physicians, whereas 26% of the CEOs were non-physicians. Physician leadership was significantly associated with lower hospital ranking (bottom 50 hospitals) in the Arab World ($P = 0.0031$). Fares Y et al concluded that hospitals positioned lower in a media ranking in the Arab World are more likely to be led by physicians rather than professional managers. Additionally, a new hospital ranking system must be developed to focus on the “patient” in the healthcare environment.

More recently, Kaiser et al [36] in a paper published in 2020 examined the data of 370 German hospitals regarding the link between the educational background of a hospital's managers and its performance in terms of medical quality and financial success. The data was extracted from the German hospital quality report which contains information such as the number of beds and procedures, type of ownership, governance structure, and the type and number of departments. The manager's characteristics were gathered through online research and if not available, the hospital was contacted.

The analysis compared medical managers and non-medical managers with an academic education in management or economics and evaluated the impact of the medical manager on economic performance. Quality is the other key dimension to be evaluated, by testing whether patient satisfaction is better when a medical manager is responsible, therefore assessing the effects of the medical manager on quality, differentiating between outcome indicators and procedural indicators.

Kaiser et al observed that hospitals with non-medical managers have significantly better financial performance, compared to those led by physicians ($p < 0.1$), and the probability to achieve poor financial performance is about 10.7 percentage points higher in hospitals with a medical manager. On the contrary, Patients admitted to hospitals with a medical manager are significantly more satisfied with their treatments, compared to those treated in manager-led institutions ($p < 0.01$). Also, if hospitals have a medical manager, the probability of achieving high patient outcomes is 13.1 percentage points greater, compared to hospitals with a non-medical manager ($p < 0.05$).

A study from Taiwan by Chen et al [37], consisted of 32 nonprofit hospitals with a total of 363 observations aimed to understand the characteristic of the board of directors and their influence on hospital performance. Educational and professional background were among the different indicators used to assess the board members, while in terms of financial performance, gross operating profit margin, return on assets, and net operating profit margins have been assessed to evaluate the hospital's performance financially. Data were retrieved from the financial statements of nonprofit proprietary hospitals compiled by the Division of Medical Services of the Ministry of Health and Welfare. The study results showed that the proportion of doctors (−0.140, $P<0.001$) and chairpersons with a medical background (−0.050, $P<0.001$) had significant negative influences on gross operating profit margin, and the proportion of directors with a management background had a significant positive influence on return on assets (0.043, $P <0.01$), while Chairperson with a medical background and the proportion of doctors (-0.065, $P<0.001$) had significant negative influences on the net operating profit margin. The paper showed that the proportion of directors with a management background was significantly and positively related to hospital financial performance, while the proportion of directors who were doctors, and chairpersons with a medical background was significantly and negatively related to hospital financial performance. In light of these findings, a balance between the proportion of board members with management experience and those who are physicians can aid in enhancing the hospital's financial performance.

4.3. Data Analysis

Data were extracted and analyzed manually using thematic analysis. In this study key themes were derived to analyze data more conveniently to answer the research question. the themes identified are:

- Impact of medical leadership on healthcare quality
- Leadership and financial performance
- Impact of Training in Management and Leadership

4.3.1. Impact of Medical Leadership on Healthcare Quality

Goodall [32] and Tasi et al. [33] used the U.S. News and World Report (USNWR) ranking to evaluate the relationship between leadership and organizational ranking, and as mentioned before the IHQ assesses the performance in the areas of structure, outcome, and patient safety. Consequently, both of the previous studies concluded that hospitals led by a medical leader had higher USNWR ratings and IHQ index than the hospitals led by non-medicals. Although the usage of the Cybermetric indicators in Fares et al [35] was an extremely different approach to assessing the performance of the hospital with different types of leadership backgrounds, it was indeed the only available approach to retrieve data using a common indicator targeting a wide population such as the Arab world. Furthermore, they concluded that the hospitals that have a lower ranking are probably managed by a medical manager rather than a non-medical manager.

4.3.2 Leadership and Financial Performance

In this review, the paper from Taiwan [37] studied the characteristics of the board of directors to find their influence on the financial performance, and the result revealed a positive correlation between leaders with a management background and the financial performance of the hospitals, while the medical leadership negatively impact on the financial outcome. This was also apparent in Kaiser et al [36] where non-medical managers had a significantly better financial performance.

4.3.3. Impact of Training in Management and Leadership

None of the included papers provided any information on the history of training in leadership among medical managers to enable us to assess the association of training with the level of performance achieved.

5. Discussion

This review aims to explore the performance of hospitals running with two different types of leadership: medical and non-medical. Six studies had been selected for this review to assess the hospi-

tal performance from many aspects; hospital quality rating, health care quality, the financial aspect, and cybermetric indicators. The review represents different parts of the world; this gave us good diversity and the opportunity to explore the topic in different aspects. Two studies were conducted in the USA, Two in Europe –UK and Germany-, and one in Taiwan and another in the Arab world. Managers in the healthcare sector have direct responsibility for their institutional performance and the outcome, but they are not the only factor that affects the result; many other factors have a direct influence, like the skills of the staff, advanced equipment, technology, budget, etc. However, the direction and coordination of everyday operations at the highest level of management with the help of the other hospital staff is the leader's responsibility [38]. The professionalism of the manager will reflect directly in the hospital services and the ranking of the health institute.

According to the World health organization (WHO) [39], Quality of care is "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes". WHO believes that the quality of health services depends on evidence-based professional knowledge. There are many scopes on the quality of health services, where the most important is the effectiveness of the services and safety and avoiding harm while providing health care. At a governmental level, providing good health care for the population is a golden goal. For this reason, some national entities formulated specific conditions and policies that any hospital should meet to get a high ranking.

The hospitals' financial performance could result from the policy and rules constructed by the manager; different managers from different scientific backgrounds and experiences will make a different print in how they govern the hospitals. Some research suggests that medical manager can use their experience to enhance healthcare quality, and the financial outcome will increase as a result. Another group suggests that a manager with financial experience will use this knowledge to take care of the cost control of the institution [40,41]. However, in Kuntz et al [40], increasing physician participation was associated with a 5% increase in return on assets, while in Tasi et al [33] there was no difference in the total revenue and profit margins between the two types of leadership.

Training in management and leadership can have a significant impact on healthcare organizations, both in terms of improving patient outcomes and increasing the efficiency of healthcare delivery. While neither article from the included papers assessed the association of training with the level of performance achieved among the medical leaders, nor provided any background or history of training in leadership and/or management, Xirasagar et al [42,43], revealed a relationship between the training of the leaders and their leadership style. It showed that medicals who had received managerial training such as a Master of Health Administration, Masters of Business Administration, or Masters of Public Health or any other study with a management background, were likely to be more effective as leaders.

6. Limitations

This review was conducted by a single person and thus it is prone to errors and inherently subjective and may be influenced by the reviewer's personal biases, experiences and knowledge. The search was limited to two databases as opposed to the practice done in systematic reviews where researchers seek to draw all available data on the topic including published papers, grey literature, thesis and dissertations, reports, drafts, etc. The quality assessment and risk of bias that is required for systematic reviews are missing in this systematized review due to limited resources and knowledge. Therefore, while systematic reviews are considered the gold standard for synthesizing evidence, systematized reviews may be more suitable for postgraduate students due to time and resource constraints, the complexity of their research question, and the opportunity for learning outcomes and flexibility.

7. Conclusion

Although there are many papers assessing the influence of medical leadership and non-medical leadership in hospitals' performance, the evidence extracted is of different variables and a lot of confounding factors could play a role in the conclusion that has been reached, and therefore more studies with control groups are required so the results will be valid for comparison. Given these points and generally speaking, the results that are present in front of us show a positive correlation between medical leadership and hospital performance and quality ranking. The financial performance was less significant in both cohorts.

8. Recommendations

• To conduct a research assessing the impact of training in management and leadership on the existing medical leaders.

• To analyze the gaps in medical education and to shed the light on the importance of integrating physicians into leadership positions.

• To conduct a research on the influence of medical leadership and non-medical leadership in hospitals' performance with local and available indicators in Sudan to help in constructing a local ranking system for the Sudanese healthcare sector, as well as collaboration with some of the neighboring countries with similar healthcare facilities and conditions, to develop an evaluation tool for the quality of health care.

Appendix 1: PRISMA 2020 CHECKLIST

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 2-3
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	N/A
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 4
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 4
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 4
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 4
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 4
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	N/A
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	N/A
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	N/A
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	N/A
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	N/A
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 7
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 11-12
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	N/A
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 4
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	N/A
Study characteristics	17	Cite each included study and present its characteristics.	Page 5-7
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	N/A
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 5-7
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 5-7
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Page 5-7
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A

DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 7 -8
	23b	Discuss any limitations of the evidence included in the review.	N/A
	23c	Discuss any limitations of the review processes used.	Page 8
	23d	Discuss implications of the results for practice, policy, and future research.	Page 8
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	N/A
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	N/A
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	N/A
Competing interests	26	Declare any competing interests of review authors.	N/A
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	N/A

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