


BMJ Open Impact of C-level positions on hospital performance: a scoping review protocol

Dennis Henzler ^{1,2} Matthias Lukas Zuchowski ^{1,3} Mark Dominik Alscher,³ Eckhard Nagel¹

To cite: Henzler D, Zuchowski ML, Alscher MD, *et al.* Impact of C-level positions on hospital performance: a scoping review protocol. *BMJ Open* 2024;**14**:e085655. doi:10.1136/bmjopen-2024-085655

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<https://doi.org/10.1136/bmjopen-2024-085655>).

Received 22 February 2024
Accepted 25 June 2024



© Author(s) (or their employer(s)) 2024. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Institute for Management in Medicine and Health Sciences, University of Bayreuth, Bayreuth, Bavaria, Germany

²Robert Bosch Medical Research, Stuttgart, Baden-Wuerttemberg, Germany

³Robert Bosch Hospital, Stuttgart, Baden-Wuerttemberg, Germany

Correspondence to

Mr Dennis Henzler;
dennis.henzler@uni-bayreuth.de

ABSTRACT

Introduction The objective of this scoping review is to identify evidence of the impact of hospital managers in top management (c-suite) on hospital performance. Managers generally have various effects on organisational objectives of their organisations. In recent years, the healthcare sector has experienced alterations in hospital governance structures, together with the emergence of new c-suite positions, aligning more closely with those found in private organisations. Their impact on hospital performance (ie, quality of care) is not well known. This scoping review seeks to identify all the available evidence of their impact on the organisational objectives. This scoping review will include primary studies, reviews and commentaries that describe the impact of top management team members on organisational outcomes in a hospital setting.

Methods and analysis The search strategy aims to locate both published and unpublished documents (ie, grey literature) using a three-step search strategy. An exploratory search of Medline and Google Scholar identified keywords and Medical Subject Headings terms. A second search of Medline (PubMed), Web of Science Core Collection, ScienceDirect, Business Source Premier (EBSCOhost), JSTOR, BASE, Lens.org and the Google Search Engine will be performed. The scope of the search will cover 1990-present time using English search terms. Manual searching by two reviewers will be added to the search strategy. The identified documents will be independently screened, selected by two researchers and extracted by one researcher. The data are then presented in tables and graphics coupled with a descriptive summary.

Ethics and dissemination As this study neither involves human participants nor unpublished secondary data, an ethics approval is not required. Findings will be disseminated through professional networks, conference presentations and publication in a scientific journal.

Trial registration number The protocol was registered on the Open Science Framework (<https://doi.org/10.17605/OSF.IO/EBKUP>).

INTRODUCTION

While delivering clinically effective, safe and efficient healthcare is a challenge in its own right, global developments and trends, such as demographic transition and medical-technical progress, accentuate these challenges on nearly all levels of the healthcare delivery process.¹ Overall, available resources

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This scoping review protocol is the first to focus on the hospital-wide impacts of the top-management team that also includes new positions that have only been implemented in hospitals in the last years.
- ⇒ The review will take a rigorous approach, adhering to the Preferred Reporting Items for Systematic Review and Meta-Analyses extension for Scoping Reviews tool and the most current guidance on conducting scoping reviews by the Joanna Briggs Institute, in order to ensure a systematic approach to searching, screening and reporting.
- ⇒ This scoping review may miss studies that are published outside of the English or German language sphere.
- ⇒ This review will not report on the effectiveness or the methodological quality of the included studies.

are limited in every healthcare system, which heightens the need to ensure their efficient and fair use to deliver high-value care for the population. One strand of strategies for increasing the value of healthcare delivery centres around innovations in healthcare administration, such as new leadership roles and styles or the restructuring of hospital governance.^{2,3}

Hospitals constitute a vital part of the healthcare delivery process in every healthcare system and, as such, can have system-level impacts on the innovative performance of healthcare services.⁴ One current way of innovation in the hospital sector is change in the governance of hospitals. Publicly owned and administered hospitals have undergone a transformation to resemble the organisational models of the private sector, such as installing a Chief Executive Officer (CEO).⁵ Other traditional c-suite roles that have become more prominent in the hospital sector are, for instance, the Chief Financial Officer⁶ or the Chief Technical Officer.⁷ Consequently, these developments have led to a stream of research investigating whether and how new management practices or governance models affect the performance

of healthcare organisations.⁸ Recent studies have investigated the correlation between management practices, patient mortality⁹ and organisational innovativeness.¹⁰

Consequently, tailored management and leadership models for healthcare organisations, such as medical leadership,¹¹ have emerged, leading to questions about how healthcare leaders can influence the organisational culture and outcomes of their organisations.^{12–14} This line of research is based on the premise that an organisation's top executive actions have a measurable impact on organizational-level outcomes.^{15 16} In this context, it can be argued that the inclusion of new members in organisations' top management teams is a strategic response to both internal institutional and external environmental complexities.¹⁷ For instance, the inclusion of a Chief Patient Experience Officer can be seen as a reaction to the growing importance of patient-reported outcomes in reimbursement models and quality measurements in healthcare delivery.¹⁸ The growing concerns and awareness about environmental waste in general, and in the healthcare sector in particular, find an expression in the establishment of a Chief Environment Officer.¹⁹ In addition, the greater recognition of nursing professionals and their key role in the healthcare process necessitate a greater representation of the top management team in hospitals, such as the Chief Nursing Officer or Nurse Executives.^{20 21}

From research as well as from a healthcare management perspective, a comprehensive picture that would allow for a substantiated overview of the impact that c-suite positions have on the performance of hospitals is missing. Providing a comprehensive overview of the influence of hospital managers on organisational performance can foster mutual understanding and appreciation of the different roles in the healthcare delivery process. Additionally, a key management challenge involves discerning who to recruit for emerging tasks and responsibilities in areas where the organisation lacks substantial experience, such as artificial intelligence in medicine. This overview can serve as a valuable tool for supervisory boards and hospitals, aiding in strategic hiring decisions and identifying areas of hospital performance that require the right personnel. As many hospitals are publically funded, this scoping review might be useful for political decision-makers in the healthcare sector, providing them with more adequate information.

This scoping review aims to provide a comprehensive understanding of how hospital managers within top management teams influence hospital performance. The evidence will be mapped to show the impact of the c-suite (participants) of a hospital (context) on hospital performance parameters (concept). For the population of hospital managers, the review will focus on both established top management positions (ie, Chief Financial Officer) and novel leadership roles (ie, Chief Experience Officer) across different hospital contexts. While mid-level managers in hospitals are influential in their own right, the top management team usually has a greater

influence on sustainable and long-term strategic decision-making, which has wider implications for the organisation as a whole.²² Organisational objectives or hospital performance is a widely interpreted term and can include the quality of care or the financial performance of the organisation, among others.²³ We approximate the concept of hospital performance through indicators relating to (1) efficiency/utilisation, (2) financial and (3) effectiveness of hospitals.²⁴ Hereby, efficiency/utilisation indicators relate to the process of healthcare delivery, finance to financial indicators of the organisations and effectiveness to the outcomes of the services (including safety, quality and access to care). Inpatient care settings were chosen as the relevant context, as hospitals are complex organisations and subject to various external developments that necessitate the inclusion of a diverse range of managers with distinct skill sets.

A scoping review is an appropriate method to identify existing literature and provide a rigorous and transparent overview of the potentially disparate evidence on this topic.^{25 26} A preliminary search was conducted on 1 November 2023, in *Medline (PubMed)*, the *Cochrane Database of Systematic Review* and *JBIR Evidence Synthesis* and no current or planned review on the topic was identified. In 2020, a previously published systematic review collected contemporary empirical evidence of the relationship between hospital governance and performance.²⁷ However, the focus of this study was on the processes, dynamics and interconnections between the hospital board and individual members of hospital management. Based on their findings, the authors argue that the role of the Chief Medical Officer needs to be further investigated, which this study aims to map in this scoping review. Another review from 2019 focuses exclusively on hospital boards and their impact on the organisation.²⁸ Other reviews in the field of leadership research focus on the influences of specific practices or characteristics of hospital managers²⁹ or aim to provide a realistic view of medical leaders in healthcare.¹² Lega *et al*¹² advocate that forthcoming studies should concentrate on elucidating the mechanisms or mediators through which hospital managers instigate these changes or positive effects. To the best of our knowledge, no other review has specifically addressed this topic with an exclusive focus on the top management team, encompassing both traditional and emerging c-level positions. This review will present comprehensive evidence for the impact of these positions on hospital performance.

Review question(s)

What are the impacts on hospital performance of top managers of the c-suite in hospitals?

1. What are the methodological approaches used in this line of research?
2. In what areas of hospital performance and through which hospital performance indicators have these impacts been realised?

3. Through which mechanisms or mediators have the hospital managers achieved these impacts?

Inclusion criteria

Participants

This review considers studies that include senior managers in hospitals and who belong to the so-called 'c-suite' or the top management team. Hospital managers should be employees of the hospital and not serve an interim function (eg, consultant). The CEO is excluded from consideration because the primary focus is on the more specialised members of top management teams. In addition, the inclusion of CEOs, being involved in every organisational aspect of the hospital, would introduce ambiguity in attributing a specific impact on hospital performance. Other hospital managers from different settings (eg, senior clinicians), specialist managers (eg, case managers), middle management and board members of the hospital were also excluded.

Concept

The concepts of interest are studies that explore their impact on hospital performance and organisational objectives. Assessing performance indicators in hospitals assists policy-makers and managers to monitor performance and payment systems. Hospital performance can refer to a variety of indicators and factors that, among others, relate to the quality of care and financial efficiency.²³ The overall model of hospital performance is based on the categories efficiency/utilisation, finance and effectiveness.²⁴ These factors include, but are not limited to, efficiency, clinical effectiveness, patient-centeredness, staff orientation, equity, expenditure, cost and utilisation of resources. Studies were included when they suggested a causal relationship of the change in hospital performance due to the position of the top-level hospital manager in question.

Context

This review will consider studies in the context of tertiary care and include acute care hospitals as well as specialised hospitals, irrespective of geographical location, size or ownership. Other healthcare organisations such as public health institutions, community health services or facilities that provide long-term care are not included.

Types of sources

This scoping review considers both published and unpublished evidence (ie, grey literature). These sources will contain quantitative, qualitative and mixed-method study designs, irrespective of the methodological approach. In addition, systematic reviews and commentaries were included in the proposed scoping review. Conference abstracts, seminar proceedings, meeting notes and books are not eligible for this review.

METHODS

The proposed scoping review will be conducted in accordance with the JBI methodology for scoping reviews³⁰ and in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).³¹ This protocol was registered in the Open Science Framework (<https://doi.org/10.17605/OSF.IO/EBKUP>).

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Search strategy

The three-step search strategy aims to locate both published and unpublished primary studies, reviews, and text and opinion papers. An initial limited search of Medline (PubMed) and Google Scholar was performed to identify relevant articles. The text words contained in the titles and abstracts of relevant articles and the Medical Subject Headings terms used to describe the articles were used to develop a full search strategy for Medline (PubMed). The search strategy, including all the identified keywords and index terms, were adapted for each information source (see online supplemental appendix 1). The reference lists and citations of the articles selected for full-text review will be screened for additional papers using *citationchaser* to minimise the risk of overlooking relevant references.³² Sources of evidence published in English and German from 1990 to the present are included. This time span was chosen, as the emergence of newer positions within the top management team, such as the Chief Medical Information Officer, can be attributed to the advancements and possibilities associated with new technologies and digitalisation of healthcare processes.

The databases searched include Medline (PubMed), Web of Science Core Collection, Business Source Premier (EBSCOHost) and ScienceDirect. Sources of unpublished studies or grey literature to be searched include BASE, Lens.org and the Google Search Engine.

Study/source of evidence selection

Following the search, all identified records will be collated and uploaded to Rayyan³³ and duplicates will be removed. Following a pilot test by selecting a random sample of 30 titles and abstracts, titles and abstracts are screened by two independent reviewers (DH and MLZ) to assess the inclusion criteria for the review. Potentially relevant papers will be retrieved, and their citation details imported into Citavi V.6.17 (Swiss Academic Software GmbH, Wädenswil, Switzerland). Full-text citations will be reviewed in detail against the selection criteria by one reviewer (DH), with a second reviewer (MLZ) providing further input, if necessary. Any disagreements between the reviewers at each stage of the selection process will be resolved through discussion or with the help of a third reviewer (EN or DA). The reasons for exclusion of full-text

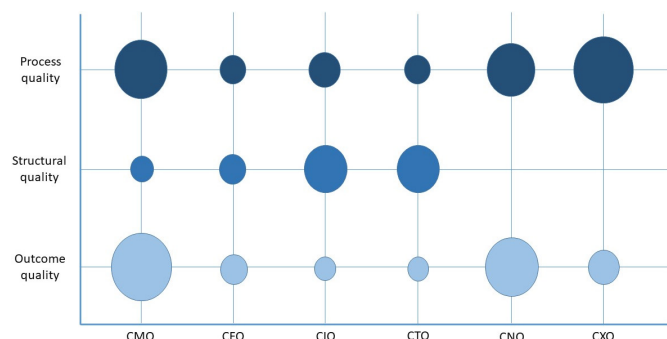


Figure 1 Impact of hospital managers' matrix. The figure shows the most frequently available evidence for each kind of hospital manager and their exemplary impact on the hospital quality concepts: process, structural and outcome quality. The x-axis lists the different kinds of hospital managers in the c-suite. CMO, Chief Medical Officer; CFO, Chief Financial Officer; CIO, Chief Information Officer; CTO, Chief Technical Officer; CNO, Chief Nursing Officer; CXO, Chief Patient Experience Officer; the y-axis lists the different kinds of hospital quality concepts.

papers that do not meet the inclusion criteria will be recorded and reported in the scoping review. The results of the search will be reported in full in the final scoping review and presented in a PRISMA flow diagram.³⁴

Data extraction

Data will be extracted from the papers included in the scoping review by one reviewer and checked by a second reviewer. A specifically designed Excel spreadsheet (Microsoft Office Professional Plus 2016, Redmond, Washington, USA) was developed by the authors and will be used as a data extraction tool. The extracted data will include specific details about the type of hospital manager (eg, CFO, CXO), hospital performance measurement (eg, quality of care, financial performance), type of hospital setting (eg, single hospital, hospital network), methods (eg, methodology and study type) and key findings relevant to the review question (see online supplemental appendix 2). The data extraction tool was pilot tested by two independent reviewers (DH and MLZ) based on six preidentified studies. The extraction fields for context and concept were adjusted to better capture relevant data from the studies. The data extraction tool will be modified and revised as necessary during the process of extracting data. The modifications are detailed in the full scoping review.

Data analysis and presentation

Relevant data for each source of evidence will be extracted to identify and explore the impact of top management team managers on hospital performance. Data will be presented in a tabulated format, indicating the methodological approach, manager type, publication details and impact on the different aspects of hospital performance. The data will be extracted according to each research question (see online supplemental appendix 2). Also, in accordance with our data extraction sheet, the

results will be presented linked to each research question. Additional data presentation styles (see figure 1) will be considered for presenting the data based on healthcare quality concepts encompassing process, structural and outcome parameters.³⁵ A frequency analysis will show the availability of evidence in different fields of hospital performance for different types of hospital managers. The results of the review will be presented in a narrative summary and describe how the results relate to the review objectives and questions.

Registration

The protocol was registered on the Open Science Framework (<https://doi.org/10.17605/OSF.IO/EBKUP>).

Contributors DH and MLZ led the conceptualisation and design of this work. DH wrote the first draft of the manuscript, incorporated feedback and finalised the manuscript with MLZ. MDA and EN contributed to the discussions and initial ideas during the conceptualisation stage and provided feedback on the manuscript. All authors approved the final draft.

Funding Robert Bosch Foundation, Grant Number: 2023-07 (MM-iLeAD)

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Dennis Henzler <http://orcid.org/0000-0002-8032-3883>

Matthias Lukas Zuchowski <http://orcid.org/0000-0002-6992-2885>

REFERENCES

- Figuerola CA, Harrison R, Chauhan A, *et al*. Priorities and challenges for health leadership and workforce management globally: a rapid review. *BMC Health Serv Res* 2019;19.
- Lega F, Palumbo R. Leading through the 'new normality' of health care. *Health Serv Manage Res* 2021;34:47–52.
- Zuchowski M, Henzler D. Medical leadership: time for a renewal of the structure and composition of senior management. *Br J Healthc Manag* 2023;29:1–5.
- Thune T, Mina A. Hospitals as innovators in the health-care system: a literature review and research agenda. *Res Policy* 2016;45:1545–57.
- Kirkpatrick I, Bullinger B, Lega F, *et al*. The translation of hospital management models in European health systems: a framework for comparison. *Brit J of Management* 2013;24:S48–61.
- Moore RW. The influence of the hospital financial officer. *Health Care Manage Rev* 1991;16:57–64.
- Heller O. The new role of chief technology officer in US hospitals. *IJTM* 1992;7:455.
- Bloom N, Sadun R, Van Reenen J. Does management matter in healthcare. 2014. Available: https://www.ihf-fih.org/resources/pdf/Does_Management_Matter_in_Healthcare.pdf

- 9 Salehnejad R, Ali M, Proudlove NC. The impact of management practices on relative patient mortality: evidence from public hospitals. *Health Serv Manage Res* 2022;35:240–50.
- 10 Schultz C, Graw J, Salomo S, *et al.* How project management and top management involvement affect the innovativeness of professional service organizations—an empirical study on hospitals. *Proj Manag J* 2019;50:460–75.
- 11 Berghout MA, Fabbicotti IN, Buljac-Samardžić M, *et al.* Medical leaders or masters?—A systematic review of medical leadership in hospital settings. *PLoS ONE* 2017;12.
- 12 Lega F, Prenestini A, Rosso M. Leadership research in healthcare: a realist review. *Health Serv Manage Res* 2017;30:94–104.
- 13 Belrhiti Z, Nebot Giral A, Marchal B. Complex leadership in healthcare: a scoping review. *Int J Health Policy Manag* 2018;7:1073–84.
- 14 Goodall AH. Physician-leaders and hospital performance: is there an association. *Soc Sci Med* 2011;73:535–9.
- 15 Hambrick DC, Mason PA. Upper echelons: the organization as a reflection of its top managers. *Acad Manag Rev* 1984;9:193.
- 16 Hambrick DC. Upper echelons theory: an update. *AMR* 2007;32:334–43.
- 17 Krücken G, Mazza C, Meyer RE, *et al.* *New themes in institutional analysis: topics and issues from european research*. Cheltenham, UK, Northampton, MA: Edward Elgar Pub (Edward Elgar E-Book Archive), 2017.
- 18 Breen W, Choi ShearldKet *al.* The association between an established chief experience officer role and hospital patient experience scores. *Pat Exp J* 2021;8:69–76.
- 19 Stamps DC, Waller MG, Foley SM, *et al.* Chief nursing officer council partners with sustainability department to develop a model of success for reducing the organization's carbon footprint. *Nurse Lead* 2020;18:586–91.
- 20 Acorn M. Reflections from a system chief nursing executive: intention to lead. *Int Nurs Rev* 2021;68:437–40.
- 21 González-García A, Pinto-Carral A, Pérez-González S, *et al.* Nurse managers' competencies: a scoping review. *J Nurs Manag* 2021;29:1410–9.
- 22 Wang G, Holmes RM, Oh I, *et al.* Do ceos matter to firm strategic actions and firm performance? A meta-analytic investigation based on upper echelons theory. *Pers Psychol* 2016;69:775–862.
- 23 Carini E, Gabutti I, Frisicale EM, *et al.* Assessing hospital performance indicators. What dimensions? Evidence from an umbrella review. *BMC Health Serv Res* 2020;20:1038.
- 24 Pourmohammadi K, Hatam N, Shojaei P, *et al.* A comprehensive map of the evidence on the performance evaluation indicators of public hospitals: a scoping study and best fit framework synthesis. *Cost Eff Resour Alloc* 2018;16:64.
- 25 Munn Z, Peters MDJ, Stern C, *et al.* Systematic review or scoping review? Guidance for authors when choosing between a systematic or Scoping review approach. *BMC Med Res Methodol* 2018;18.
- 26 Khalil H, Peters MD, Tricco AC, *et al.* Conducting high quality scoping reviews—challenges and solutions. *J Clin Epidemiol* 2021;130:156–60.
- 27 De Regge M, Eeckloo K. Balancing hospital governance: a systematic review of 15 years of empirical research. *Soc Sci Med* 2020;262:113252.
- 28 Erwin CO, Landry AY, Livingston AC, *et al.* Effective governance and hospital boards revisited: reflections on 25 years of research. *Med Care Res Rev* 2019;76:131–66.
- 29 Lega F, Prenestini A, Spurgeon P. Is management essential to improving the performance and sustainability of health care systems and organizations? A systematic review and a roadmap for future studies. *Value Health* 2013;16:S46–51.
- 30 Peters M, Godfrey C, McInerney P, *et al.* Chapter 11: scoping reviews. In: Aromataris E, Munn Z, eds. *JBI manual for evidence synthesis*. JBI, 2020.
- 31 Tricco AC, Lillie E, Zarin W, *et al.* PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
- 32 Haddaway NR, Grainger MJ, Gray CT. Citationchaser: a tool for transparent and efficient forward and backward citation chasing in systematic searching. *Res Synth Methods* 2022;13:533–45.
- 33 Ouzzani M, Hammady H, Fedorowicz Z, *et al.* Rayyan—a web and mobile app for systematic reviews. *Syst Rev* 2016;5.
- 34 Page MJ, McKenzie JE, Bossuyt PM, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:71.
- 35 Donabedian A. Evaluating the quality of medical care. *Milbank Q* 2005;83:691–729.

Appendix I: Search strategy

MEDLINE (PubMed)

Date searched: May 4, 2024

Records retrieved: 3,912

Search	Query	Records retrieved
#1	"c suite"[Title/Abstract] OR "c-suite" [Title{Abstract] OR "c suite executives"[Title/Abstract] OR "c suite level"[Title/Abstract] OR "institutional management teams"[MeSH Terms] OR "top management team"[Title/Abstract] OR "executive team"[Title/Abstract] OR "executive*"[Title/Abstract] OR "chief executive officers, hospital"[MeSH Terms] OR "senior management"[Title/Abstract] OR "senior leadership"[Title/Abstract] OR "hospital administrators"[MeSH Terms]	79,687
#2	"chief medical officer"[Title/Abstract] OR "physician executive"[Title/Abstract] OR "clinician executive"[Title/Abstract] OR "chief nursing officer"[Title/Abstract] OR "chief nurse executives"[Title/Abstract] OR "executive nurse directors"[Title/Abstract] OR "nurse administrators"[MeSH Terms] OR "chief clinical informatics officer"[Title/Abstract] OR "chief medical information officer"[Title/Abstract] OR "chief clinical information officer"[Title/Abstract] OR "chief patient experience officer"[Title/Abstract] OR "patient experience officer"[Title/Abstract] OR "chief operating officer"[Title/Abstract] OR "executive director"[Title/Abstract] OR "chief financial officer"[Title/Abstract] OR "financial executive*"[Title/Abstract]	16,091
#3	#1 OR #2	93,091
#4	("hospital"[Title/Abstract] OR ("organizational"[Title/Abstract] OR "financial"[Title/Abstract])) AND ("objective"[Title/Abstract] OR "impact*"[Title/Abstract] OR "performance"[Title/Abstract] OR ("outcome*"[Title/Abstract] OR "effect*"[Title/Abstract]))) OR "organizational objectives"[MeSH Terms] OR "hospital efficiency"[Title/Abstract] OR "hospital quality"[Title/Abstract] OR "economics, hospital"[MeSH Terms]	867,318
#5	"Hospitals"[MeSH Terms] OR "inpatient*"[Title/Abstract] OR "hospital*"[Title/Abstract]	1,892,098
#6	#3 AND #4 AND #5	4,263
Limited to 1990-present, English and German only		3,912

Web of Science Core Collection

Date searched: May 4, 2024

Records: 171

Search	Query	Records retrieved
#1	TS=("c suite" OR "c-suite" OR "executives" OR "top management team" OR "executive team" OR "executive" OR "chief executive officers" OR "senior leadership")	140,233
#2	TS=("chief medical officer" OR "clinician executive" OR "chief nursing officer" OR "chief nurse executive" OR "executive nurse director" OR "chief clinical informatics officer" OR "chief medical information officer" OR "chief clinical information officer" OR "chief patient experience officer" OR "chief operating officer" OR "chief financial officer" OR "financial executive")	978
#3	#1 OR #2	140,900
#4	TS=("hospital performance" OR "hospital outcome" OR "hospital quality" OR "financial performance" OR "organizational performance" OR "organizational outcome" OR "financial outcome" OR "hospital efficiency")	39,790
#5	TS=("hospital" OR "hospitals" OR "inpatient")	1,454,361
#6	#3 AND #4 AND #5	173
Limited to 1990-present, English and German only		171

Business Source Premier & EconLit (EbscoHost)

Date searched: 4 May, 2024

Records: 158

Search	Query	Records retrieved
#1	Title and abstract separately searched and then combined with “OR”: ("c suite" OR "c-suite" OR "executives" OR "top management team" OR "executive team" OR "executive" OR "chief executive officers" OR "senior leadership")	943,989
#2	Title and abstract separately searched and then combined with “OR”: ("chief medical officer" OR "clinician executive" OR "chief nursing officer" OR "chief nurse executive" OR "executive nurse director" OR "chief clinical informatics officer" OR "chief medical	70,534

	information officer" OR "chief clinical information officer" OR "chief patient experience officer" OR "chief operating officer" OR "chief financial officer" OR "financial executive")	
#3	#1 OR #3	992,870
#4	Title and abstract separately searched and then combined with "OR": ("hospital performance" OR "hospital outcome" OR "hospital quality" OR "financial performance" OR "organizational performance" OR "organizational outcome" OR "financial outcome" OR "hospital efficiency")	113,608
#5	Title and abstract separately searched and then combined with "OR": "hospital" OR "hospitals" OR "inpatient"	178,914
#6	#3 AND #4 AND #5	158
Limited to 1990-present, English and German only		158

ScienceDirect

Date searched: 4 May, 2024

Records: 5

Search	Query	Records retrieved
#1	Title, abstract or author-specified keywords: ("c suite" OR "top management team" OR "senior leadership" OR "c-suite") AND ("hospital performance" OR "hospital efficiency" OR "hospital quality" OR "hospital financial performance")	4
#2	Title, abstract or author-specified keywords: ("chief medical officer" OR "chief nursing officer" OR "clinician executive" OR "executive nurse director") AND ("hospital performance" OR "hospital efficiency" OR "hospital quality" OR "hospital financial performance")	1
#3	Title, abstract or author-specified keywords: ("chief clinical informatics officer" OR "chief medical information officer" OR "chief clinical information officer") AND ("hospital performance" OR "hospital efficiency" OR "hospital quality" OR "hospital financial performance")	0
#4	Title, abstract or author-specified keywords: ("chief patient experience officer" OR "chief operating officer" OR "chief financial officer") AND ("hospital performance" OR "hospital efficiency" OR "hospital quality" OR "hospital financial performance")	0
#5	Limited to 1990-present, English and German only	5

Records: 44

Search	Query	Records retrieved
#1	Tit: ("c suite" OR "c-suite" OR "executives" OR "top management team" OR "executive team" OR "executive" OR "chief executive officers" OR "senior leadership")	454
#2	Tit: ("chief medical officer" OR "clinician executive" OR "chief nursing officer" OR "chief nurse executive" OR "executive nurse director" OR "chief clinical informatics officer" OR "chief medical information officer" OR "chief clinical information officer" OR "chief patient experience officer" OR "chief operating officer" OR "chief financial officer" OR "financial executive")	502
#3	#1 OR #2	956
#4	Tit: ("hospital performance" OR "hospital outcome" OR "hospital quality" OR "financial performance" OR "organizational performance" OR "organizational outcome" OR "financial outcome" OR "hospital efficiency")	42,927
#5	tit: ("hospital" OR "hospitals" OR "inpatient")	465
#6	#3 AND #4 AND #5	44
Limited to 1990-present, English and German only		44

Lens.org

Date searched: 4 May, 2024

Records: 1,602

Search	Query	Records retrieved
#1	("c suite" OR (c-suite OR (executives OR ("top management team" OR ("executive team" OR (executive OR ("chief executive officers" OR ("senior leadership" OR ("chief medical officer" OR ("clinician executive" OR ("chief nursing officer" OR ("chief nurse executive" OR ("executive nurse director" OR ("chief clinical informatics officer" OR ("chief medical information officer" OR ("chief clinical information officer" OR ("chief patient experience officer" OR ("chief operating officer" OR ("chief financial officer" OR "financial executive"))))))))))))))))) AND (("hospital performance" OR ("hospital outcome" OR ("hospital quality" OR ("financial performance" OR ("organizational performance" OR (1,680

	"organizational outcome" OR ("financial outcome" OR "hospital efficiency")))) AND (hospital OR (hospitals OR inpatient)))	
Limited to 1990-present, English and German only		1,602

Google Search Engine

- *Name/URL:* <https://www.google.com/>
- *Dates searched:* 4 May, 2024
- *Search terms:* We combined search terms from the population part of the search strategy (“c suite”, “chief medical officer”, etc.) and combined them with terms from the concept and context part of the search strategy (“hospital efficiency”, “hospital performance”, “hospital financial performance”)
- *Selection of results:* The first 200 results returned from the search strategy were scanned for relevance and those judged to be potentially relevant were followed up.

Appendix II: Data extraction tool

Review Question	Data to be extracted	Coding examples
Review Question 1 General Information “What are the methodological approaches in this field?”	Authors/title	N/A
	Year of publication	<ul style="list-style-type: none">• Year of publication versus date of collected samples
	Research Country	List of countries
	Research design	<div>Empirical study designs</div> <ul style="list-style-type: none">• Quantitative (longitudinal vs. cross-sectional; statistical methods; survey)• Qualitative (Interviews, open surveys)• Mixed methods• Limitations
	Characteristics of hospitals	<ul style="list-style-type: none">• Public versus private ownership• For-profit versus non-for-profit• General vs specialist hospital vs hospital network• Rural versus urban• Data: publicly available versus not publicly available (self-collected)
Review Question 2 “Through which mechanisms or mediators have the hospital managers these impacts?”	Aim/purpose of the study	Description of the overall impacts on hospital performance by the top managers
	Leadership position / hospital manager	<ul style="list-style-type: none">• Description of position (e.g. CMO, CFO, CXO, etc)• Description of the responsibilities or tasks• Use of strategy/mechanism (e.g. communication, leadership style)
Review Question 3 “In what areas of hospital performance and through which hospital performance indicators have these impacts been realized?”	Type of impact on hospital performance	<ul style="list-style-type: none">• Efficiency/utilization versus financial versus effectiveness
	Measurement of outcome	<ul style="list-style-type: none">• Objective (e.g. KPI) versus subjective (self-assessment)
	Affected by the c-suite	<ul style="list-style-type: none">• Patients, staff, stakeholders• Inside versus outside the organization• Hospital wide versus several departments vs single department