CEBMa
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Evidence-Based Management

Rapid Evidence Assessment of the scientific literature on the effect of medical representation on healthcare outcomes

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Australian National University

1. Background

In September 2019, a large Australian healthcare organisation with several hospitals and out-patient clinics commissioned ANU's Research School of Management (RSM) to develop a system-wide Workplace Change Framework. In May 2020, a final report was published. One of the priorities identified by the authors is " … *improving the representation of medical staff in strategic decision-making, financial decision-making, and in leadership roles* …". For this reason, ANU's RSM commissioned the Center for Evidence-Based Management (CEBMa) to undertake a Rapid Evidence Assessment (REA) of the scientific literature to provide evidence-based insights to help improve medical representation. The REA was conducted by two independent reviewers under the supervision of Alessandra Capezio (CEBMa Fellow and Associate Professor in Organisational Behaviour at ANU's RSM) and Eric Barends (CEBMa).

2. What is a Rapid Evidence Assessment?

Evidence reviews come in many forms. One of the best-known is the conventional literature review, which provides an overview of the relevant scientific literature published on a topic. However, a conventional literature review's trustworthiness is often low: clear criteria for inclusion are lacking and studies are selected based on the researcher's individual preferences. As a result, conventional literature reviews are prone to bias. This is why 'rapid evidence assessments' (REAs) are used. An REA is a specific research methodology that aims to identify the most relevant studies on a specific topic as comprehensively as possible, and to select appropriate studies based on explicit criteria. In addition, the methodological quality of the studies included is assessed by two independent reviewers on the basis of explicit criteria. In contrast to a conventional literature review, a REA is transparent, verifiable, and reproducible, and, as a result, the likelihood of bias is considerably smaller.

3. Main question: What will the REA answer?

What is known in the scientific literature about the effect of the (lack of) representation of physicians in the internal governance of a hospital on organizational and clinical outcomes?

Other issues raised, which will form the basis of our conclusion to the question above, are:

1. *Why and how is the representation of physicians assumed to affect organizational and clinical outcomes?*
2. *What is known about the overall effect of medical representation on organizational (e.g. performance, commitment, engagement, satisfaction, turnover, absenteeism) and clinical outcomes?*
3. *What is known about the effect of possible moderators and/or mediators?*
4. *What forms of medical representation (formal and informal) are used and what is known about their effectiveness?*

4. Search strategy: How was the research evidence obtained?

Four databases were used to identify studies: ABI/INFORM Global from ProQuest, Business Source Premier from EBSCO, PsycINFO from Ovid, MEDLINE, and Google Scholar. Our search applied the following general search filters:

1. Scholarly journals, peer-reviewed
2. Published in the period 1980 to 2020 for meta-analyses and 2010 to 2020 for primary studies
3. Articles in English

A search was conducted using combinations of various search terms, including 'doctor', 'physician', 'clinician', 'engagement', 'involvement', 'commitment', and 'governance'. In addition, the references listed in the retrieved studies were screened in order to identify additional studies for possible inclusion in the REA. An overview of all search terms and queries is provided in Appendix I.

5. Selection: How were studies selected?

After removal of duplicates, a total number of 396 studies were identified. Study selection took place in two phases. First, titles and abstracts of the 396 studies identified were screened for relevance. In case of doubt or lack of information, the study was included. This first phase yielded 59 studies. Screening of the references yielded 9 additional studies. Second, studies were selected based on the full text of the article using these inclusion criteria:

1. Type of studies: Focusing on quantitative, empirical studies.
2. Measurement: Only studies in which relationships among team attributes, contextual factors and outcomes were quantitatively measured
3. Context: Only studies related to workplace settings
4. Level of trustworthiness: Only studies that were graded level C or above (see below).

In addition, the following exclusion criteria were applied:

- Studies on the drivers/determinants for the uptake & implementation of virtual working
- Studies on teams working within a virtual world
- Studies on virtual student teams or virtual training groups
- Studies on the effect tools aimed at supporting virtual teams

This second phase yielded a total number of 30 studies. An overview of the selection process is provided in Appendix II.

6.1. Critical appraisal: How was the quality of the evidence judged?

In almost any situation it is possible to find a scientific study to support or refute a theory or a claim. Thus, it is important to determine which studies are trustworthy (i.e. valid and reliable) and which are not. The trustworthiness of a scientific study is first determined by its methodological appropriateness. To determine the methodological appropriateness of the included study's research design, the classification system of Shadish, Cook and Campbell (2002), and Petticrew and Roberts (2006) was used. In addition, a study's trustworthiness is determined by its methodological quality (its strengths and weaknesses). For instance, was the sample size large enough and were reliable measurement methods used? To determine methodological quality, all the studies included were systematically assessed on explicit quality criteria. Finally, the effect sizes were identified. An effect (e.g. a correlation, Cohen's d or omega) can be statistically significant but may not necessarily be of practical relevance: even a trivial effect can be statistically significant if the sample size is big enough. For this reason, the effect size – a standard measure of the magnitude of the effect – of the studies included was assessed.

For a detailed explanation of how the quality of included studies was judged, see *CEBMa Guideline for Rapid Evidence Assessments in Management and Organizations* (Barends & Rousseau, 2017).

6.2. Critical appraisal: What is the quality of the studies included?

The overall quality of the studies included varies, depending on the type of research question being answered. All of the 16 studies that concerned a cause-and-effect question concerned designs that lacked a control group and/or a pre-measure and were therefore graded level C or lower, indicating a low level

of trustworthiness. Of the six studies that concerned differences or frequencies, five were graded as level A, indicating a high level of trustworthiness. The remaining eight studies concerned research questions tied to predictions (antecedents) and varied from level A to level D. An overview of all studies included and information regarding year of publication, research design, sample size, population, main findings, effect sizes and limitations is provided in Appendix III.

7. Main Findings

A bit of history

In the past most hospitals were led by doctors, with an administrator in a coordinating rather than a leadership role (Goodall, 2011). This situation changed in the 1980s when Western healthcare adopted a more business-like model. In this new model, full-time managers were responsible for the financial, strategic and entrepreneurial aspects of healthcare organisations (Clay Williams, 2012). For example, in the UK, the release of the Griffiths Report in 1983 resulted in a new purchaser-provider model of British healthcare, which gave non-medical managers greater control over resources (Griffiths, 1983). A similar pattern emerged in the US, where the introduction of managed care in the 1990s led to the introduction of the full-time general healthcare manager, in order to secure greater control over resource allocation and decision-making (Hoff, 1997). Although some of these new managerial roles were taken up by physicians, most of them considered this new function unattractive. In addition, there was a widely held assumption that physicians were not suitable for executive management because they lack the necessary managerial mindset and skills, and tend to focus on individual patients rather than the hospital's managerial issues (Huff, 2010). As a result, physicians were no longer involved in decisions about healthcare strategy and resource allocation, and a formal representation of the medical staff in the organisation's internal governance was often lacking. In fact, in the 2000s, a large majority of hospitals in the UK and the US were led by non-physician managers (Horton, 2008; Gunderman 2009). A similar pattern was seen in European countries, where governments started to reform healthcare, replacing the traditional logic of medical professionalism with business-like logics (Koelewijn, 2012).

Nowadays the pendulum seems to be swinging back. It has been suggested that placing physicians into leadership positions and giving them a formal voice in the organisation's internal governance can result in improved hospital performance and patient care (see e.g. Horton, 2008; Halligan, 2008; Darzi, 2009; Candace 2009; Dwyer, 2010). As a result, there is a strong call for 'medical leadership', that is, physicians with formal managerial roles that involve general management and leadership activities in order to balance the demands of management and medicine (Berghout, 2017). For example, in the UK medical leadership was prioritised in the 2008 National Health Service review (Darzi, 2009) and in The Netherlands there was a sector-wide call to bring 'the doctor in the lead' (Wittman, 2011). In addition, renowned American hospitals - for example the Cleveland and Mayo Clinics - have introduced medical leadership training, and management education is incorporated into medical degrees.

Question 1: Why and how is the representation of physicians assumed to affect organizational and clinical outcomes?

It is widely assumed that greater involvement of physicians in governance and executive roles improves the efficiency and effectiveness of healthcare organisations (Sarto, 2016). There are several beliefs and theories that underlie this assumption. First, it is believed that giving people voice and involving them in decision-making processes lead to a better understanding of the decision taken, and consequently, to provide greater support for the decision and better outcomes. Indeed, there is some evidence from meta-analyses that participative decision-making leads to better organisational outcomes, however, the observed correlations are rather low (see e.g. Doucouliagos, 1995). In addition, there is evidence

suggesting that participation leads to higher (affective) commitment, which in turn leads to higher performance. But again, the effect sizes are rather small (see e.g. Riketta, 2002) and sometimes even negative (see e.g. Ng, 2015). The question therefore is whether these findings also apply to an organization (hospital) with highly educated and experienced professionals (physicians). Second, decisions based on the combination of evidence from multiple sources yield better outcomes than a decision based on a single source of evidence (see e.g. McNees, 1990, and Tetlock, 2006). In addition, experienced professionals – such as physicians – often have 'experiential' knowledge acquired by repeated experience and practice that can be vital for determining whether a management issue requires attention, if the available data are trustworthy, whether the evidence applies in a particular situation, and how likely a proposed solution is to work in a particular context. Third, within a healthcare organisation, physicians are perceived as powerful stakeholders. Their values and concerns reflect what they believe to be important, which in turn affects how they tend to react to the possible consequences of the proposed decision. It is therefore assumed that denying physicians a formal voice in the organisation's internal governance will induce resistance to change and negatively affect the outcome of the decisions made (see e.g. Erwin, 2010). Finally, physician executives are assumed to bridge the clinical and managerial realm: they serve as a countervailing power that gives the medical profession and patients a strong voice at the strategic level, and as such improve the quality of the hospital's internal governance (Hoff, 2001).

Question 2: What is known about the overall effect of medical representation on organizational and clinical outcomes?

Finding 1: *Having physicians represented on the board of healthcare organizations is a strong predictor of a range of organizational and clinical performance outcomes (level B)*

Several systematic reviews and longitudinal studies consistently found that having physicians on organizational governance boards has a positive impact on both organizational and clinical performance outcomes (see e.g. Bai, 2012; Clay-Williams, 2017; Lega, 2013; Sarto, 2016; Savage, 2017). For example, a 4-year panel study among English NHS hospitals found that a greater percentage of physicians on boards was predictive of better quality ratings, lower morbidity rates (Veronesi, 2013) and patient experience (Veronesi, 2015). This finding was confirmed by a 5-year panel study among Californian hospitals showing that the absence of physicians on the board is associated with a decrease of three to five percent points in three (heart failure, pneumonia, surgery) out of four (+heart attack) clinical quality indicators (Bai, 2015). In addition, several cross-sectional studies have shown strong correlations between the extent that physicians are structurally involved in hospital leadership and a wide range of performance outcomes (Goodall, 2011; Kuntz, 2013; Rotar, 2016; Tasi, 2019; Rundall, 2004). Direct comparisons between physician-led (e.g. a CEO with a Doctor of Medicine degree) and non-physician led hospitals showed similar large effect sizes (Tasi, 2019). It is assumed by some authors, that because of physicians' clinical expertise, the presence of physicians on the board is more likely to increase the board's emphasis on quality of care (Bai, 2015). In addition, findings from cross-sectional studies suggests that the representation of physicians in strategic decision making processes increases their commitment and understanding of the rationale for the decision taken (Parayitam, 2007). This review found no studies highlighting negative effects.

Finding 2: *There is no evidence indicating that physician managers are better (or worse) managers than non-physician managers*

It is often assumed that, for healthcare organizations, physician managers are better managers than non-physician managers. However, this review found no studies supporting (or refuting) this claim. There is some evidence that suggests that physician-managers are better able to influence their colleagues than

non-physician managers, but this evidence is qualitative in nature and low in quality (Witman, 2010).

Finding 3: *Decision preferences are affected by the way an issue is interpreted, rather than the professional background of the decision-maker (Level D)*

There is little to no support for the so called 'physician – manager dichotomy' regarding decision preferences. Decision preferences tend to be affected by the way individual physicians and managers interpret an issue (Golden, 2000). For example, when physicians interpret an issue as an organizational issue (e.g. staffing, resource allocation, costs), they tend to have the same decision preferences as managers. When physicians interpret an issue as being in the domain of clinical practice, their decision preferences tend to focus on maintaining standards of clinical practice. This suggests that some issues may need to be reframed in order to mitigate conflict, and that an explicit effort be made to manage the framing of issues as organisational issues, or issues in a professional domain.

Finding 4: *Physicians in executive and managerial positions first and foremost identify as a physician rather than a manager*

Qualitative studies suggest that physicians in an administrative or managerial role first and foremost identify as a physician (Farrell Quin, 2013). For a physician, taking on a management or leadership role poses a threat to their identity as a physician since doing so may be socially constructed as un-prestigious, unscientific, and threatening to their identity as a physician. Having both identities creates challenges for a physician in two ways (Anderson, 2015). First, being a physician assumes that they are independent and autonomous from the organisation whereas being a manager assumes they are subordinate to the organisation. Second, there are assumed to be tensions in the guiding logics of physician and managers where the former is grounded in medical science and the latter in bureaucratic order and control. This suggests that deliberate efforts need to be made to manage the multifaceted identities of physicians in leadership roles, and that social identity needs to be considered in leadership training for both physicians and non-physicians.

Finding 5: *Physicians' engagement in (and commitment to) strategic decision-making are determined by a wide range of factors - other than formal representation (Level B).*

A recent longitudinal study found that, in general, physicians are not strongly inclined to participate in formal strategic decision-making processes (Dellve, 2018). However, several studies suggest that their engagement, involvement and commitment increase:

- When they are provided time and resources to participate in improvement projects or decision-making processes (Dellve, 2018; Rundall, 2004))
- When there is consensus among their colleagues that the hospital's executive team stimulates improvement initiatives (Dückers, 2009)
- When they feel that management treats and rewards them fairly and values them (Ellershaw, 2014; Karsh, 2010)
- When they perceive control over how they do their work and believe that their work demands are reasonable (Freeborn, 2001).
- When they feel that the organization's goals are compatible with their own (Karsh, 2010)
- When they have a good relationship with management (Karsh, 2010)
- When decision-making processes are transparent, they have a voice in resource-related decisions, and management frequently communicates with them (Rundall, 2004).

Finding 6: ***There is strong evidence that the physician – management relationship is negatively affected by the way both groups perceive each other (Level A)***

Several studies indicate that how physicians and managers perceive each other affects physicians' engagement, commitment, and finally decision quality. In particular, it was found that in most Western countries, the overall perception of the physician – management relationship is positive, but physicians tend to be more pessimistic about this relationship than managers (Rundall, 2004). In particular, physicians feel managers have decreased physician economic and professional autonomy and are continuously trying to bring clinical care within a managerial framework. (Koelewijn, 2012). In addition, it was found that hospital managers see physicians as higher in professional status and power, and having different goals. Conversely, physicians see hospital managers as lower in professional status but higher in power, and to have different goals (Klopper Kes, 2009; Koelewijn, 2012).

Finding 7: ***In the physician-management relationship, trust is an important factor (Level A)***

Several studies indicate that, with regard to the positive effect of involving physicians in decision making processes, trust seems to be a key element. Several studies indicate that, in general, physicians perceive less manager-physician trust than do managers. Physicians' trust tends to increase, however, when they perceive they have influence and voice in domains that they believe to be important or consider as traditionally 'theirs' (Succi, 1998). Trust is based on perceptions of a person's motives, honesty, and character – also referred to as 'integrity-based trust'. In the physician-management relationship, however, 'competence-based trust' seems equally (or even more) relevant: The expectation that someone has the technical skills and experience needed to fulfil his/her obligations. Thus, if physicians feel that managers have the requisite skills and knowledge to make valid decisions, then this has a strong, positive effect on physicians understanding, commitment, and consequently support for the decision taken (Parayitam, 2010).

8. Conclusion

This REA has identified a large number of high-quality studies on the effects of medical representation on hospitals' organizational and clinical outcomes. The included studies consistently demonstrate that, in healthcare organizations, including physicians on the executive board has a positive impact on clinical and organizational outcomes, and positively affects physicians' engagement, involvement, and commitment. However, no studies were found in which a direct comparison was made between the formal representation of physicians in the internal governance of the organization and other forms of representation. As such, it can't be concluded that 'formal' representation has a larger effect than other interventions shown to increase physicians' engagement and decision-quality, such as giving physicians time and resources to participate in improvement projects or giving them 'voice' in decisions they feel are important. In addition, this REA demonstrates that there are several other factors that affect physicians' commitment and engagement, such as trust in management, decision-making transparency, fair process, and frequent communication with management. Thus, formal representation helps but is not sufficient. Efforts need to be made to foster trust and co-operative relationships between physicians and managers. In particular, attention needs to be given to the role social perception, cognition and identity in these relationships. Training non-physician leaders to be more scientific, evidence-based and transparent is important for building both competence-based and integrity-based trust among physicians and reducing the perceived discrepancy between the logic of science of medicine and the 'craft' of management. This will also help to mitigate negative stereotypes associated with physicians taking on leadership roles. Finally, explicit efforts need to be made to manage the framing of issues in decision-making as either organisational issues and clinical issues.

9. Limitations

This REA aims to provide a balanced assessment of what is known in the scientific literature about the effect of medical representation on healthcare outcomes by using the systematic review method to search and critically appraise empirical studies. In order to be 'rapid', concessions were made in relation to the breadth and depth of the search process, such as the exclusion of unpublished studies, the use of a limited number of databases and a focus on empirical research published in the period 1980 to 2020 for meta-analyses and 2010 to 2020 for primary studies. As a consequence, some relevant studies may have been missed.

A second limitation concerns the critical appraisal of the studies included, which did not incorporate a comprehensive review of the psychometric properties of their tests, scales and questionnaires.

A third limitation concerns the focus on meta-analyses and high-quality studies, i.e. studies with a control group and/or longitudinal studies. As a consequence, new, promising findings relevant for practice may have been missed.

Given these limitations, care must be taken not to present the findings presented in this REA as conclusive.

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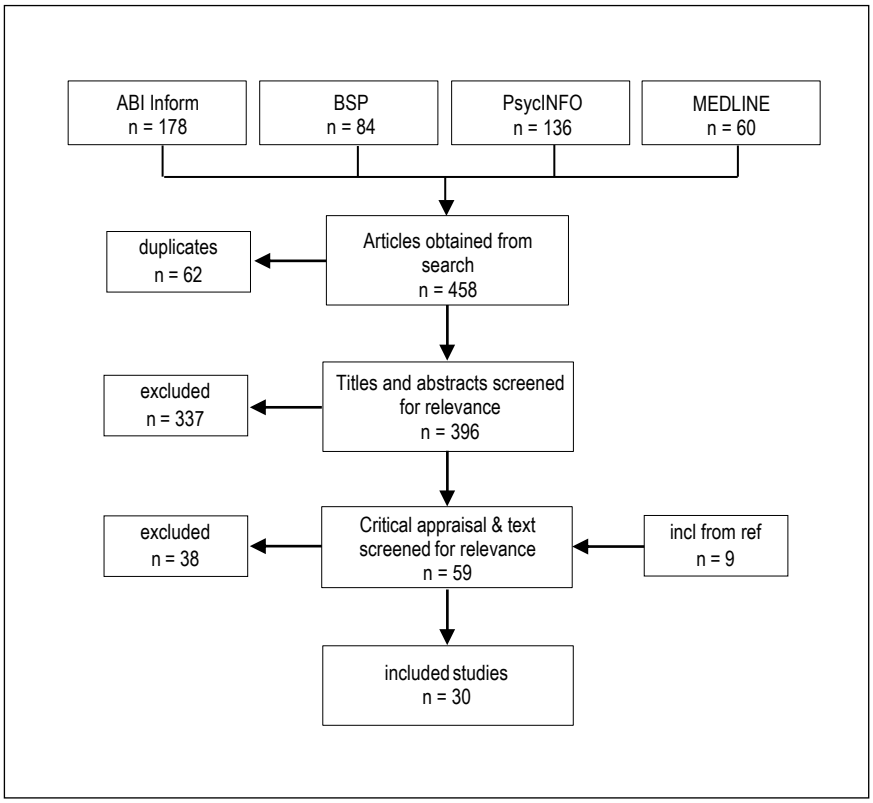
APPENDIX 1

Search terms & hits

ABI/Inform Global, Business Source Elite, PsycINFO peer reviewed, scholarly journals, April 2020				
Search terms	**ABI**	**BSP**	**PSY**	**Medline**
S1: ti(doctor*) OR ti(physician*) OR ti(clinician*) OR ti("medical staff") OR ti("medical specialist*")	5,568	7,010	17,743	155,841
S2: ti(manager*) OR ti(leader*) OR ti(executive*)	46,272	54,112	33,569	43,294
S3: S1 AND S2 (Medline: mesh 'organization administration')	332	396	170	535
S4: ti("clinical leader*") OR ti("medical leader*") OR ti("medical manager*") (Medline: mesh 'organization administration')	51	64	74	181
S5: S1 AND ti(engag*) OR ti(commit*)	80	81	151	285
S6: S1 AND ti(board) OR ti(governance*) (Medline: mesh 'organization administration')	35	39	25	34
S7: S3 OR S4 OR S5 OR S6	475	567	413	-
S8: filter meta-analyses, limit > 1980 (Medline: reviews > 1990)	2	2	17	60
S9: filter controlled/longitudinal studies, limit > 2000	10	4	33	-
S10: filter empirical studies NOT S9, limit > 2000	166	78	86	-
Total	**178**	**84**	**136**	**60**

APPENDIX II

SELECTION OF STUDIES



Appendix III

Data extraction table

1st Author & year	Design & sample size	Sector / Population	Main findings	Effect sizes	Limitations	Level
1. Bai, 2012	Longitudinal (5 year) panel study n = 137 (for-profit) and 226 (not-for-profit)	California profit and non-profit hospitals	Representation of physicians on the board is positively associated with social performance in for-profit hospitals (H3a), but not in non-profit hospitals (H3b) Social performance = community benefits (uncompensated care costs + education expense + research expense /gross patient revenues), diversity, employee relations, CSR, and care for the environment	1. ZO correlation physicians on board – community benefits: r = .22 H3a & b: only unstandardized regression coefficients are reported	Unclear whether the variables were measured within the same sample units over time	B/C (predict)
2. Bai, 2015	Longitudinal (5 year) panel study n = ?	California not-for-profit hospitals	The absence of physicians on the board is associated with a decrease of 3 to 5 percentage points in three (heart failure, pneumonia, surgery) out of four (+ heart attack) measures of care quality. Note: The authors argue that, because of physicians' clinical expertise, the presence of physicians on the board is more likely to increase the board's emphasis on quality of care, enhance the effectiveness of oversight, and thus improve quality of care. Consequently, hospitals without physicians on the board are more likely to have their quality of care compromised.	Only unstandardized regression coefficients are reported	Sample size unclear Unclear whether the variables were measured within the same sample units over time	B/C (predict)
3. Clay-Williams, 2017	Systematic review s = 16	Hospitals in the US, UK and Europe	1. Evidence supporting the positive association between including doctors on organisational governing boards and organisational performance is accumulating. This finding is consistent with pre-2005 data 2. Despite many published articles on the topic of whether hospitals and healthcare organisations perform better when led by doctors, there are few empirical studies that directly compared the performance of medical and non-medical managers.	Not reported	narrative review, limited search, small sample of studies note: most relevant studies are included in this REA	B/C (predict)

4. Dellve, 2018	Longitudinal (1 year) panel study n = 838 (5 hospitals)	Nurses and physicians from Swedish hospitals	1. Positive attitudes (1a) to engage in organizational developments were higher among nurses and assistant nurses, while negative attitudes (1b) were higher among physicians. 2. Physicians were most concerned about the risk of time conflicts when engaging in organizational improvements (2a). They also to a greater extent had the opinion that their engagement in developments would not lead to any meaningful results (2b). 3. Increased resources were associated with all kinds of increased engagement. However, most associations were rather weak.	1a. d = .27 1b. d = .76 2a. d = .90 2b. d = .31 3. < .1	No serious limitations	A (diff)
5. Dobrzykowski, 2020	Cross-sectional study and org data analysis n = 302	Executives from acute care hospitals in the US	Physician employment (formal governance) is NOT associated with process integration (H2b) Note: the authors argue that this result supports the notion that although employment relationships may serve to better align the goals of the physician and the hospital, other factors may mitigate formal governance mechanisms as an effective means of coordination.	1. ns	Messy study, findings are based on perceptual measures	D (predict)
6. Dückers, 2009	Cross-sectional study n = 286 (8 hospitals)	Dutch hospital physicians	1. Physicians noticing that their executives stimulate improvement initiatives, participate NOT more than their colleagues who do not notice or know (H1) 2. The relation between noticing that CEOs stimulate improvement and physician participation is moderated by the consensus among colleagues. Thus, physicians' participation in improvement projects depends on whether there is consensus among colleagues that the CEO stimulates improvement	1. ns 2. not reported	No serious limitations	D (effect)
7. Ellershaw, 2014	Cross-sectional study n = 81	Australian hospital clinicians	Examines the relationships between psychological contract breach, organisational justice and negative affectivity on organisational commitment, in a medical context. Organisational commitment was related to negative affectivity, psychological contract obligation and the interaction between psychological contract breach and distributive justice. (Note: the latter indicates that when a perceived breach occurs, if the individual is not being treated fairly or rewarded, then organizational commitment decreases. See also practical implications in paper)	ZO correlations and beta's with org commitment: neg affect = -.16/-.28 psy cont br = -.25/ns psy cont ob =.32/.36 psy cont ff = .41/ns proc just = .25/ns psy contr br x dis just β = .43	no serious limitations	D (effect)

8. Freeborn, 2001	Cross-sectional study n = 608	Kaiser Permanente physicians in the US (Northwest and Ohio regions)	Physicians who perceive greater control over the practice environment, who perceive that their work demands are reasonable, and who have more support from colleagues have higher levels of satisfaction, organizational commitment, and psychological well-being. Thus, interventions and administrative changes that give physicians more control over how they do their professional work and that enhance social supports are likely to improve both physician morale and performance.	ZO correlations and beta's with org commitment: control = .51/.44 demands = .23/ns soc support = .33/.21	no serious limitations	D (effect)
9. Gokce 2014	Cross-sectional survey n = 78	Doctors working at four hospitals in a private healthcare group in Turkey	Doctors' perceptions of leadership behaviour had a positive effect on their level of organizational commitment.	Only unstandardized regression coefficients are reported	Although the MLQ was used, it remains unclear what "perception of leadership" entails.	D- (effect)
10. Golden, 2000	Cross-sectional study n = 350	CFOs, CMOs, and physicians of	1. How an issue was interpreted (eg managerial or medical) (H5) had a greater influence on the final decision than whether the decision-maker was a physician or non-physician manager (H1-4). 2. The stereotypical expectation that doctors represent the interests of clinicians and that non-clinician managers would represent the interests of the organization was not found to be supportable. 3. Thus, the extent that physicians and non-physician managers conflict, they may do so because they interpret 'identical' issues differently.	Only SEM path coefficients are reported	self-report, prone to social desirability bias	A (diff)
11. Goodall, 2011	Cross-sectional study n = 300	US healthcare executives from the top-100 hospitals in the three specialties of cancer, digestive disorders, heart and heart surgery	Examines whether hospitals situated higher in the US News' and World Report's 'Best Hospitals' 2009 league-table are more likely to be headed by physician-leaders or professional managers. 1. A positive association was found between physician CEOs and hospital performance for all three hospital specialties. Note: While higher-performing hospitals were associated with physician CEOs, causation was not able to be determined (eg, higher-performing hospitals may just prefer to have doctors as leaders).	1. r = .30 β = .66? Adjusted R_2 = .09 -.14	no serious limitations	D (effect/ predict)
12. Houston, 2018	Quantitative pre-post survey and focus groups n = 17 + 17	Clinicians and managers from NHS Hospital trusts	Participants reported increased understanding, changed attitudes and better communication between clinicians and managers following a paired learning program. Note: Paired Learning is a peer-learning method that buddies together different professional groups to improve knowledge, attitudes and relationships.	not reported	not all participants completed both the pre- and post survey small sample size relevant statistical information is missing	D- (effect)

12. Karsh, 2010	Cross-sectional study n = 1,482	US family physicians	1. Satisfaction with one's health care organization (HCO) was most strongly predicted by a) the degree to which physicians perceived that management valued and recognized them, b) the extent to which physicians perceived the organization's goals to be compatible with their own 2. Commitment to the organization was predicted by physicians' relationships with management. 3. Income satisfaction, satisfaction with work/practice environment, job satisfaction, career satisfaction, satisfaction with HMO practice, control over day-to-day affairs and control over managerial decisions did not predict any of the outcomes.	1. Only SEM coefficients are reported 2. r = .72 β = .77 3. 0 or ns	final sample size unclear	D (predict)
14. Klopper-Kes, 2009	Cross-sectional study (n = 166) and qualitative study	physicians and managers of four Dutch general hospitals	Study on how physicians and hospital managers perceive each other 1. Hospital managers see physicians as higher in professional status and power, and having different goals. 2. Physicians see hospital managers to have higher power, lower status, and different goals (see paper for other perceptions).	not reported	no serious limitations	A (diff)
15. Koelewijn, 2012	Systematic review s = 34	mixed	1. Contextual changes have considerably altered the relation between managers and physicians in hospitals as dependencies have shifted and intensified. Physicians' economic autonomy has been diminished while there have been continuous efforts to bring clinical care within a management framework. This is associated with interest dissatisfaction among physicians. 2. Both physicians and managers believe the other group has more power than they attribute to their own group. 3. Management can improve hospital performance by developing an organization-wide market orientation and actively seeking the involvement of physicians in the entrepreneurial process, from idea generation to the implementation of new health services	not reported	limited search no critical appraisal of studies included design of included studies unclear review method insufficiently described narrative synthesis and rather loose and haphazard summary of findings	D- (all)
16. Kuntz, 2013	Cross-sectional study n = 604	Public and private hospitals in Germany	Examines the influence of the extent to which physicians are involved in hospital leadership on staff-to-patient ratios (note: High staff-to-patient ratios for both nurses and doctors are associated with better hospital performance) There was a positive relationship between a full-time medical director (MD) or heavily involved part-time MD and a higher staff-top-patient ratio (Note: the outcome was controlled for a range of confounding variables, such as size, rural/urban location, ownership structure, and case-mix)	not reported	no serious limitations	D (effect)

17. Lega, 2013	Systematic review s = 37	na	1. The participation of doctors in decision-making and change is negatively correlated (= positive) with HSMR indicators. 2. There is some evidence that organizations run by doctors perform better than others	1. r = -.36 2. not reported	prone to selection bias no information regarding the design and methodological quality of the included studies does not qualify as a systematic review.	C (effect)
18. Macinatti, 2016	Cross-sectional study n = 65	Medical managers holding budget responsibilities of a general hospital located in Italy	1. Budgetary participation is positively related to medical manager managerial self-efficacy (H1). 2. Budgetary participation is positively related to medical manager managerial job engagement (H2) 3. Managerial self-efficacy is positively related to medical manager job performance (H3). 4. Managerial job engagement is positively related to medical manager job performance (H4). 5. Managerial job engagement and managerial self-efficacy mediate the effects of budgetary participation on medical manager job performance (H6) * job engagement is defined as 'cognitive and emotional energy invested in a work role'	ZO correlations budget participation self eff = .50 job eng = .51 mgr perf = .23 Unclear whether the beta's reported are standardized	Risk of reverse causation Control variables such as prof. identity, patient complexity and tenure explain a large proportion of the variance Barron & Kenny was used to test for mediation	D- (predict)
19. MacPhail, 2015	Post-test n = 31?	Medical, nursing and allied health professionals at a large regional health-care centre in Victoria, Australia.	Participants of a clinical leadership program reported that - they were more willing to take on a leadership role within their team (93 percent). - they were more willing to lead at the level of department (79 percent) - they were more willing to lead at the level of the organisation (64 percent). Note: Key elements of the programme were: one 2-hour session on-site once per month for nine to ten months (equivalent to 20 hours), with a guest speaker and group discussion; one self-organised external site visit and one mini-project, both completed in small, interdisciplinary groups; and a presentation to peers and executive staff of their learning from the site visit and the mini-project.	not reported	Final sample size unclear Risk of selection bias: potential participants were invited to self-nominate	D- (effect)
20. Parayitam, 2007	Cross-sectional study n = 361 (109 hospitals)	CEOs and strategic decision makers (e.g. executive officers, director of human resources, chiefs	1. The greater the presence of physician executives in SDMTs* the greater will be the decision quality (H1) 2. The greater the presence of physician executives in SDMTs the greater will be the understanding of the rationale of decisions (H2). 3. The greater the presence of physician executives in SDMTs the greater will be the commitment to decisions (H3).	ZO correlations physician ratio: dec quality = .59 understand = .29 commitment = .43 regr coefficients* physician ratio:	self-reported	D (predict/ effect)

		of staff) in US hospitals	Thus, the presence of professional doctors in the decision-making process enhances commitment, understanding and decision quality in healthcare organizations, suggesting that healthcare administrators need to engage physician executives in strategic decision-making to have successful decision outcomes *SDMT = strategic decision making team	dec quality = .45 understand = .16 commitment = .23 (*controlled for organizational slack, team size, team tenure, task-based conflict, and relationship conflict)		
21. Parayitam, 2010	Cross-sectional study n = 109	top management teams of US hospitals, including CEOs, administrators and physician executives	1. Competence-based trust among the strategic decision-making teams in hospitals will be positively related to decision quality (H1). 2. Competence-based trust among the strategic decision-making teams in hospitals will be positively related to understanding of rationale behind the decision (H2). 3. Competence-based trust among the strategic decision-making teams in hospitals will be positively related to decision commitment (H3). The findings suggest that competence-based trust is the key to successful strategic decision making while lack of trust may hinder the effectiveness of decision implementation in healthcare organizations. * The expectation that a partner has the technical skills, experience, and reliability needed to fulfill its obligations (in contrast: integrity-based trust = perceptions about a partner's motives, honesty, and character)	1. r = .64 β = .48 2. r = .41 β = .21 3 r = .56 β = .19 (beta's are controlled for organizational slack, team size, team tenure, task-based conflict, and relationship conflict)	self-reported	D (predict/ effect)
22. Rotar, 2016	Cross-sectional study and national stat data n = 1505 (118 hospitals)	hospitals from OECD countries	1. In OECD countries medical doctors are increasingly involved in hospital governance on both departmental (middle management) and strategic hospital level (see table 1 and 3). 2. Doctors involvement is associated with better implemented quality management systems, especially when doctors are involved in strategic management decision making. Hence increased focus on hospital performance seems to go along with strong medical involvement in hospital governance.	not reported	no serious limitations	D (predict/ effect)

23. Rundall, 2004	Cross-sectional study n = 1,209	Chief executives, medical directors, clinical directors and nonmedical managers from the UK and US	1. The overall perception of doctor-manager relationship is positive across both countries, but doctors tend to be more pessimistic than managers. 2. The perceived doctor-manager relationship varies between chief executives (76%), senior managers (60%), medical directors (59%), physician executives (52%), and clinical directors (37%). 3. In both countries, a high proportion of doctors and managers expressed dissatisfaction with the "time, resources, and energy devoted to nurturing effective relationships locally." 4. Doctors and managers identified similar barriers. A high proportion of respondents from both countries identified external factors (such as governmental budget cuts, pressure from third parties to increase physicians' workload, and the turbulence of the policy environment) as important barriers to improving doctor-manager relationships. 5. Other common sources of strain were concerns over resource availability and the relative power of doctors and managers. 6. Substantial divergence of opinion was expressed with respect to internal factors that affect doctor-manager relationships: Respondents from the US were more negative than those from the UK in their ratings of teamwork and communication between doctors and managers, and they were less likely to have confidence in the medical staff. Respondents from the UK were more likely to believe that hospital management is driven more by financial than clinical priorities. 7. Strategies to improve doctor-manager relationships are: - including greater organizational transparency in decision making - more frequent communication between managers and donors - more physician involvement in decision making, especially with regard to important resource-related decisions, and in organizational governance.	not reported (only percentages are provided) 2. percentage responding positive (= 4 or 5 on a 5-point scale) 3. 24 to 44% 4. 76 to 60%	no serious limitations	A (diff) (1-6) D (effect) (7)
24. Sarto, 2016	Systematic review of cross-sectional studies s = 19	mixed	The findings of the studies included show a positive impact of clinician's involvement in leadership positions on different types of outcome measures, with only a handful of studies highlighting a negative impact on financial and social performance. Therefore, the review lends support to the prevalent move across health systems towards increasing the presence of clinicians in leadership positions in healthcare organisations.	not reported	limited search included studies not critically appraised rather haphazard summary of the findings	C (effect)

25. Savage, 2017	Scoping review of quantitative, qualitative, and conceptual papers s = 82	mixed	1. Support was found for the positive correlation between physician leadership and the quality of care performance dimension 2. Support was found for the positive correlation between physician leadership and the management of financial and operational resources 3. The outcomes outside of the performance dimension included effects on staff satisfaction, retention, performance, and burnout, as well as psychological safety, respect, shared goals, approval and support of political reforms [37]; and the adoption of information technology. The following two mechanisms, though with inconclusive and unclear evidence, seem to have a role in mediating the positive relationship between physician leadership and performance outcomes: a) A medical background grants physician leaders increased credibility compared to managers without medical training b) Clinical knowledge is essential for improved decision making	not reported	limited search time period restricted to 2006 – 2016 selection of papers unclear included studies not critically appraised	C (effect)
26. Schultz, 2004	Cross-sectional study (computer based simulation of a hospital system) n = 38	senior health care executives (20 with MBAs, 18 with medical background including MDs, RNs and LPNs)	1. No statistically significant differences were found between medically educated and managerially educated senior managers in their ability to make strategic decisions that maximize the net income or the quality of care of the healthcare organization. 2. Characteristics other than educational degree appear to have stronger influence on a CEO's ability to make successful strategic decisions. note: medically educated managers used more quality of care information: d = 1.1	1. ns 2. not reported	research methodology somewhat unclear	B (diff)
27. Succi, 1998	Cross-sectional study n = 2,806 (794 hospitals)	CEO's and physician leaders in the US	1. Overall, managers perceive greater manager-physician trust than physicians. 2. Physicians perceive greater trust when they hold power in all 4 decision-making area's (H2a-d) 3. Managers perceive greater trust only when they hold power in the area of cost & quality management (H1a) 4. Surprisingly, both managers and physicians did NOT perceive less trust when members of the other group held more power in decisions area where their own group had traditionally dominated. 5. To increase trust physicians should be given more influence and 'voice' in hospital decisions	all ZO correlations are round .2 /.3 regression coefficients are all rather low, often below .1 4. ns	study was conducted 22 years ago prone to halo effect	A (diff) D (effect)

28. Tasi, 2019	Cross-sectional study n = 115	The 115 largest hospitals in the US	1. Hospitals in physician-led hospital systems had higher quality ratings across all specialties. 2. Hospitals in physician-led hospital systems had more inpatient days per hospital bed.	1. d = .87 2. d = .50	no serious limitations	A (diff)
29. Veronesi, 2012	Longitudinal (4 year) panel study n = 102	boards of English NHS hospital trusts	1. A greater percentage of doctors on boards was associated with a better-quality rating of service providers. 2. This finding was 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. 3. No equivalent association was found for clinical professions such as nurses and other allied health professions.	not reported, only percentages are provided 1. Trusts achieving a four rating had an average of 15.01% of directors with a medical background, whereas in trusts achieving only a one rating, 11.09% board directors were doctors.	complex statistical methods used unclear whether the variables were measured within the same sample units over time	A/B (predict)
30. Veronesi, 2015	Longitudinal (4 year) panel study n = unclear (99?)	NHS Hospital trusts	1. Clinical participation on hospital governing boards can significantly improve the patient experience of the care provided. 2. Patient experience appears to markedly improve in those organizations that have both higher levels of clinical involvement in their strategic apex and greater flexibility in decision-making.	Unclear, but the coefficients reported are rather low.	complex statistical methods used unclear whether the variables were measured within the same sample units over time	B/C (predict)

Included qualitative studies

1st Author & year	Design & sample size	Sector / Population	Main findings	Effect sizes	Limitations	Level
1. Anderson, 2015	4 longitudinal qualitative case studies (structured interviews) n = 52?	physicians and managers	1. The study illustrates that medical leadership implies identity struggles when physicians have manager positions, because of the different characteristics of the social identities of managers and physicians. 2. Major differences are related between physicians as autonomous individuals in a system and managers as subordinates to the organizational system. 3. There are psychological mechanisms that evoke the physician identity more often than the managerial identity among physicians who are managers, which explains why physicians who are managers tend to remain foremost physicians. 4. The implications of the findings suggest that managerial physicians might not be the best prerequisite for medical leadership, but instead, cooperative relationships between physicians and non-physician managers might be a less difficult way to support medical leadership.	na	unclear whether researchers' perspective is taken into account, therefore prone to confirmation bias? limited use of quality control measures	na
2. Baathe, 2013	qualitative study (interviews) n = 25	physicians and managers	1. If managers want physicians to engage in improvements, they must learn to understand and appreciate physician identity	na	unclear whether researchers' perspective is taken into account, therefore prone to confirmation bias? limited use of quality control measures	na

3. Farrell Quinn, 2013	Qualitative study (interviews) n = 25	physician leaders at three organizational levels in four US hospitals	1. Physicians in administrative and managerial roles first and foremost identify as a physicians on individual, relational and organizational basis.	na	small sample size unclear whether researchers' perspective is taken into account, therefore prone to confirmation bias? limited use of quality control measures	na
4. Witman, 2010	Qualitative case study n = 29	department heads, residents and non-medical managers of a Dutch university hospital	1. Doctors are better able to influence their colleagues' clinical activities than managers. 2. The formal hierarchy of the hospital organization should be brought more in line with the informal professional hierarchy. 3. The principle of 'doctor in the lead' is a promising strategy, provided that these doctors are wise men and spokesmen.	na	small sample size unclear whether researchers' perspective is taken into account, therefore prone to confirmation bias? limited use of quality control measures	na

Overview of excluded studies

1. Callaly, 2005	Short literature review, merely anecdotal, no quantitative outcome measures are reported
2. Clark, 2012	Short literature review, merely anecdotal, no quantitative outcome measures are reported
3. Clay-Williams, 2010	Systematic review: work in progress? Unclear whether the final version was ever published. Crucial information is missing. Most of the (relevant) studies included are also included in this REA.
4. Comber, 2016	Not relevant to the REA question: concerns physicians' perception of leadership effectiveness in their clinical and non-clinical roles by identifying their political skill levels.
5. Cregard, 2015	Qualitative study on the perceptions of perceptions (!) of trust in physician-managers
6. De Andrade, 2014	Outcome measure is level of uncompensated care provision
7. Davies, 2003-a	Short literature review, merely anecdotal, no quantitative outcome measures are reported
8. Davies, 2003-b	Findings are included in Rundall 2004
9. Demir, 2008	Investigates the effects of organizational and demographic variables on Turkish military physicians' work commitment
10. Dickinson, 2013	Merely descriptive study based on a survey among medical directors or chief executives of NHS trusts and in-depth qualitative case studies, reports on representation of doctors on boards and perceived lack of engagement.
11. Dudley, 2013	Not an empirical study
12. Dwyer, 2010	Short literature review, merely anecdotal, no quantitative outcome measures are reported

13. Fulop, 2010	Not an empirical study
14. Giri, 2017	Not relevant to the REA question: explores to what extent occupational health physicians in the UK are motivated to engage in medical leadership roles.
15. Grady, 2019	Traditional literature review, merely anecdotal, no quantitative outcome measures are reported
16. Hartley, 2014	Traditional literature review and analysis of policy documents and healthcare statistics. Compares the way in which UK and Polish health systems have altered in recent years and focuses on the way in which these changes may be impacting on hospital doctors' engagement with management.
17. Hoff, 2001	Data were collected in 1996
18. Ingebrigtsen, 2014	Very limited search (period of 2,5 years), not relevant to the REA question (focusses on associations between the attributes of clinical leaders and IT adoption)
19. Ireri, 2011	Explores the experiences, competencies, and development needs of doctor managers in the UK, mostly qualitative
20. Jagajeevan, 2013	Dissertation, not retrievable
21. Jorm, 2019	Paper provides insufficient information about methodology, statistics and quantitative outcomes. In addition, no clear distinction is made between work-engagement, employee engagement, clinical engagement, and clinician involvement.
22. Kippist, 2009	Qualitative evaluation of a clinical leadership development program run for an Australian cancer therapy centre
23. Kreindler, 2014	Qualitative study of physician engagement in a very specific context: the implementation of a new American model of healthcare integration (the Accountable Care Organisation, ACO)

24. Kreindler, 2019	Qualitative study of physician engagement in a very specific context: primary care renewal and Canadian fee-for-service family physicians,
25. Lister, 2000	Not an empirical study
26. Loh, 2016	Qualitative study that explores the beliefs of doctors in leadership roles of the concept of “the dark side”
27. MacIntosh, 2012	Qualitative study (focus groups) that examines the extent to which clinician-manager interactions are dialogic (rather than dialectic)
28. O’Hare, 2007	Single case study, paper provides too limited information to determine relevance and/or methodological quality.
29. Pereira, 2018	Scoping review on factors associated with, and tools used to measure physician engagement. Concerns work related predictors for work engagement rather than employee engagement, factors such as representation, participation in decision-making were not reported.
30. Quinlivan, 2007	Concerns a representation model (i.e. the Western Australian Clinical Senate Model) on state level (rather then organisational level).
31. Shanafelt, 2017	Short literature review, focusses on efforts to reduce physician burnout and promote work engagement.
32. Sebastian, 2014	Not an empirical study
33. Shaw, 2019	Descriptive scoping review, examines how physician-led system engagement strategies in acute care settings can be classified.
34. Sladek, 2010	Uses unreliable measurement scales (e.g. Myers–Briggs Type Indicator)

35. Spurgeon, 2015	Concern a (cross-sectional) analyses of a large UK database and a smaller subset of Australian data from a previous study. Both sample (eg size, characteristics) and research methodology are rather unclear, crucial statistical information is lacking.
36. Styhre, 2016	Qualitative case study, small sample (n = 15 residents from four Swedish health care organizations)
37. Taylor, 2008	Short literature review, merely anecdotal, no quantitative outcome measures are reported
38. Underdahl, 2018	Presented as a meta-analysis but is merely a short (unsystematic/anecdotal) literature review, no quantitative outcome measures are reported. In addition, focusses on interrelationships between physician engagement, job satisfaction, and burnout as components of resilience and 'grit'.