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Doctors in leadership roles: consequences for quality and safety

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IMPACT

In the English NHS and other healthcare systems (such as Belgium, Germany and Italy), there has been growing enthusiasm for increasing the involvement of clinical professionals in senior leadership and management roles. This article examines the performance benefits of this involvement for quality and safety outcomes—specifically patient experience and hospital infection rates. The findings have important implications for key stakeholders. For professional bodies, the results could help to assuage concerns about management and persuade more doctors to invest in leadership training and education. For managers, the findings suggest increasing support for clinical leadership roles and focusing more on succession and career planning at the organizational level. Lastly, for policy-makers, the results further reinforce the need to boost clinical leadership in healthcare services—both rhetorically and in terms of the allocation of resources.

ABSTRACT

The evidence base on the consequences of medical leadership for the performance of healthcare organizations remains fragmented. Drawing on five years' worth (2013–2017) of data, the authors explore the impact of increasing medical participation in the senior management teams (SMTs) of acute care hospital trusts in the English National Health Service. Employing a quasi-experimental research design, based on propensity using score matching and GMM system of equations, the analysis shows the positive effect of having a critical mass of medical leaders on the SMT of public hospitals on patient experience scores and infection rates.

KEYWORDS

Critical mass; governance; healthcare; medical leadership; NHS; organizational performance; quality; safety

Introduction

Globally, there has been a growing enthusiasm for medical leadership, which appears to have moved 'from the dark side to centre stage' (Ham et al., 2011, p. 11). Historically, doctors, like other clinicians, have always performed de facto 'management' roles through their day-to-day involvement in the co-ordination and administration of health services (Klein, 2010). In the UK National Health Service (NHS), this involvement grew following a major re-organization in 1974 and the introduction of 'consensus management' teams at hospital and district levels, which included doctors (Harrison et al., 1992). However, since the early 1990s, the participation of clinicians in governance in the NHS became even more formalized with the creation of discrete management and leadership roles, such as clinical directors and medical (and nursing) directors, or even CEOs, sitting on governing boards (Numerato et al., 2012; Jones & Fulop, 2021). Since then, the number of medical managers in the NHS has increased steadily. Kirkpatrick et al. (2021), for example, note that the proportion of doctors in senior management teams (SMTs) of acute healthcare trusts rose from 1.68 in 2007, to an average of 3.4 in 2018.

Many argue that these trends are having a marked impact on the identities and practices of medical professionals, including changes in their education and training (McGivern et al., 2015; Cascón-Pereira et al., 2016). Having captured the imagination of academics and policy-makers (Ferlie, 2018), growth in the number of doctors in management and leadership roles is also thought to have positive consequences for the performance of health services, notably in relation to quality and patient wellbeing. The more recent experience of the Covid 19 pandemic has only served to raise expectations: 'thrusting medical leadership into the brightest light' (Abbasi, 2021). Increasingly, it is believed that having more doctors and other clinicians, such as nurses and other healthcare professionals, assisting with management will be a positive driver of improvement.

Nevertheless, questions remain about the impact of enhanced medical leadership on healthcare outcomes. In recent years, an increasing number of studies have focused on this topic, notably on the role of doctors sitting on the boards or top management teams of hospitals and other healthcare organizations (Goodall, 2011; Sarto & Veronesi, 2016). However, the results of this research have been mixed, with some studies even highlighting a potentially negative influence of medical leaders. Added to this are certain methodological limitations, prompting the authors of one systematic review of the field to conclude that there is still only a '*modest* body of evidence' to support 'the importance of including doctors on organizational governing boards' (Clay-Williams et al., 2017, p. 10).

In light of these knowledge gaps, the aim of this article is to contribute to the evidence base for medical leadership. Specifically, we address the following research question:

> *Does a greater critical mass of doctors involved in SMTs of healthcare organizations lead to improved performance?*

To do so, we focus on the illustrative case of SMTs in acute care hospital trusts of the English NHS—a context where

medical participation has been growing steadily (Kirkpatrick et al., 2021). We draw, for the first time, on a mix of longitudinal administrative data sources over five years (2013–2017) relating to both the composition of managers in NHS organizations (clinical and non-clinical) and two distinct performance outcomes: quality (measured by patient experience) and safety (gauged by hospital infection rates). The data analysis follows a novel two-stage approach which differs from previous studies in the field. First, using a propensity score matching technique, we identify a 'treatment group' of hospital trusts with two or more doctors involved in their SMTs (associated with a greater critical mass). Second, we evaluate the effect of this treatment group on performance applying a GMM system of equations approach.

In what follows, we first review the literature on medical leadership and performance, specifically focusing on board level participation of doctors. We then summarise our data and methods before turning to the main results which highlight the significant contribution doctors on SMTs make to the performance of NHS acute care trusts. A key contribution of the study is, therefore, to significantly enhance the evidence base for medical leadership, raising implications for research, practice and policy.

Literature review and research focus

Doctors in strategic roles: What do they contribute?

Over the past three decades, healthcare organizations worldwide (and, more broadly, the whole of the public sector) have faced intensifying demands to enhance their management practices and capabilities. In the non-profit sector, this has been associated with the creation of new corporate bodies, responsible for hospitals or primary care services, with greater formal autonomy over budgets and planning (Krachler et al., 2022; Kirkpatrick et al., 2017). Examples of this include hospital trusts in the English NHS, limited liability companies in the Czech Republic and 'public enterprise entity hospitals' in Portugal (Saltman et al., 2011). These reforms have led to significant changes in the governance of healthcare organizations (Veronesi & Keasey, 2010), with the establishment of governing boards made up of professional managers and, increasingly, clinicians. In the NHS, for example, hospital trusts are now required to include both medical and nursing directors on their boards while, in some cases, even the CEO might have a clinical background (Jones & Fulop, 2021).

This involvement of clinicians, especially doctors, in the strategic management of healthcare organizations is widely assumed to be beneficial. In a speech to the NHS Annual Conference in December 2016, the then UK Secretary of State for Health declared: 'we should today ask whether the NHS made a historic mistake in the 1980s by deliberately creating a manager class who were not clinicians' (Hunt, 2016). Accordingly, policy guidance has sought to encourage healthcare workforce governance to move doctors into senior management roles and support this with human resource planning and staff development (Anandandaciva et al., 2018). While many professionals are sceptical about the value of management work (Bresnen et al., 2019), there have been concerted efforts nationally to integrate leadership education into the medical curriculum (Kirkpatrick et al., 2021). This has gone hand in hand with the formation of new professional associations, such as the Faculty of Medical Leadership and Management (FMLM) in the UK (Moralee & Exworthy, 2018).

To some extent, the assumed benefits of medical leadership are supported by studies focused on the governing boards of healthcare organizations (Clay-Williams et al., 2017; Sarto & Veronesi, 2016). In the USA, Jiang et al. (2009) show how greater doctor participation on hospital committees improves performance in terms of the care process and mortality rates, helping to foster quality-centred cultures. Goodall (2011) also finds that having a CEO with a medical background generates greater quality improvements and results in higher hospital rankings. Studies conducted in other healthcare systems, including Germany (Kuntz et al., 2016), Belgium (De Harlez & Malagueno, 2016), and Italy (Sarto et al., 2019), reach very similar conclusions. Focusing on English NHS hospital trusts, Veronesi et al. (2013) report that a greater proportion of directors with a medical background is associated with higher quality ratings and positive outcomes for hospital mortality rates, as well as better patient experience scores (Veronesi et al., 2015). There is also evidence suggesting that medical leadership could be financially beneficial (Veronesi et al., 2014; Aly et al., 2022).

This positive impact of medical leaders is attributed to a number of factors. Falcone and Satiani (2008, p. 88) observe that 'doctor CEOs and board directors' bring 'a unique set of skills to the business of medicine'. Their professional education and socialization ensures that doctors apply a different mind-set to non-clinical managers—they are more focused on patient wellbeing and quality concerns (Davies et al., 2003). This could result in 'increased understanding and credibility and better communication' (Dorgan et al., 2010, p. 14), helping to improve the quality of decisions and their implementation. Similarly, Ferlie (2018, p. 278) highlights the potential of medical leaders to 'rebalance the agendas of health care organizations to prevent capture by over narrow financial objectives'.

In addition, CEOs or board members with medical backgrounds may benefit from enhanced credibility, helping them to communicate policies to professionals and ensure greater engagement and implementation (Spurgeon et al., 2017). While general managers often struggle to get their message across, it is arguably easier for medical professionals to 'enter discussions with the medical staff about the hospital's efforts to contain costs without raising concerns that proposed changes will adversely affect hospital quality' (Succi & Alexander, 1999, p. 35). Qualitative research on the role of medical leaders supports this idea. Jones and Fulop (2021), for example, highlight the diplomatic work of medical directors in the NHS brokering the interests of different communities and pushing for a greater clinical voice. This work also highlights the importance of having a greater critical mass (Kanter, 1977) of medical leaders on boards. The argument here is that increasing the number of doctors will foster stronger networks, capabilities and enhanced voice—ensuing that their role does not become wholly tokenistic.

Emerging concerns

Despite the mounting (but still limited) evidence, questions remain about the impact of medical leaders in strategic

roles of healthcare organizations. Theoretically, it is possible that that increasing medical leadership could be ineffective, or counter-productive, if it fosters 'pro-professional cultures' (Jacobs et al., 2013). This might be partly due to a lack of training that doctors receive, especially in relation to finance. A study by Ham et al. (2011) described medically-trained CEOs in the NHS as 'keen amateurs' with limited knowledge of management or a clear sense of identity or purpose. Concerns are also linked to the tangible risk that medical managers will over-identify with their clinical roles, acting as conservative individualists rather than team players (Kippist & Fitzgerald, 2009). This tribal mentality could lead to a refusal to engage outside clinical networks or, worse still, the adoption of a narrow, 'custodial' orientation towards management (Ackroyd et al., 2007). When this occurs, medical leaders are primarily focused on advocacy on behalf of their professional colleagues (as ambassadors), seeking to protect rather than challenge the status quo (Addicott, 2008). Succi and Alexander (1999), for example, note how the increasing influence of doctors in the allocation of resources is associated with certain moral hazards and the risk that hospital service priorities are shaped or captured by the interest of powerful medical groups.

Furthermore, it is possible that even when medical leaders are engaged in leadership, they are often unable to exert significant voice or influence. This powerlessness may be attributable to the 'harsh almost bullying performance culture' of many NHS governing boards (Vize, 2016). It might also be exacerbated by the absence of what the FMLM describes as an effective leadership 'infrastructure' in the form of administrative support, access to networks and training (Moralee & Exworthy, 2018).

In addition, the evidence base itself is patchy. Notwithstanding the growing volume of studies noted earlier, there is still no consensus about the impact of medical leaders—with some studies reporting insignificant or even negative results (Sarto & Veronesi, 2016). With a few exceptions (Veronesi et al., 2013; De Andrade Costa, 2014; Veronesi et al., 2015), most of the latest research has been cross-sectional and with incomplete samples, making it hard to assert the direction of causality over time. Many studies have also relied heavily on self-reported data from questionnaires, which limits generalizability and increases the risks associated with single source bias. Indeed, it is largely for these reasons that Clay-Williams et al. (2017) describe the evidence as 'modest'. They identify generalizability as a particular problem, with only two out of 16 quantitative studies being rated as 'good'. Therefore, despite 'a large volume of published literature on the topic of whether hospitals and healthcare organizations perform better when led by doctors … there are few studies that have examined this topic in a robust way' (Clay-Williams et al., 2017, p. 10).

Hence, there is a clear need for more research to strengthen the evidence base for increasing medical participation in strategic roles of healthcare organizations. This is especially important given the policy relevance of this topic and the potential hidden costs associated with making the wrong choices. Employing doctors as managers, moving away from their core training, is an expensive option—increasingly so in light of growing labour shortages for medically-qualified staff in most healthcare systems. In this context, it is more important than ever to understand the consequences, if any, that efforts to divert medical professionals into management will have. In short, is it worth it?

Methodology and data

To address the central research question concentrating on the relationship between a critical mass of doctors in leadership roles and improved performance of healthcare organizations, as a specific case we focused on the SMTs of acute care hospital trusts in the English NHS. These hospital trusts are frequently multi-site organizations and, although predominantly publicly funded, they have their own independent board structures, comprising executive and non-executive members, and operate with degrees of formal autonomy over planning and resources. SMTs consist of all of board members and senior managers who report directly to them.

To overcome many of the limitations of the earlier research, notably single source bias, we assembled a wide mix of routinely collected administrative data sources. Specifically, we drew on a range of NHS official statistics (mainly gathered from NHS Digital) to identify organizational characteristics and performance outcomes. Additionally, we accessed a commercial repository of information—the *Database of NHS Management* owned by Wilmington Healthcare Ltd—to assess the degree of medical participation in SMTs. Published since 1991 and comprising more than 30,000 individuals, the database assigns 'managerial' roles (more than 100 in total) to individuals with decision-making power in relation to budgeting, financial management, and allocation and management of resources. Importantly, this resource also makes it possible to identify managers with a medical background (Kirkpatrick et al., 2021).

Following previous research (Veronesi et al., 2019; Veronesi et al., 2022), we focused on two performance outcomes—service quality and patient safety—using data from NHS Digital. Specifically, we tried to assess 'quality and safety' by focusing on:

- Annual patient experience (or satisfaction) scores for each hospital trust, taken from the NHS Adult Inpatient Survey.
- Hospital infection rates (lower rates indicating higher quality), sourced from www.gov.uk.

These two measures make sense theoretically because both are likely to be directly influenced by management decisions (for example with regard to the allocation of resources, staff development, communication and priority setting). This is more so than for other measures of quality, such as mortality or readmission rates which, arguably, have far more to do with patient characteristics and clinical practices at the operational level.

Drawing on these multiple data sources, in contrast to many previous studies, we were able to create a longitudinal, cumulative database (available from the authors on request) covering five years (from 2013 to 2017). This resulted in an unbalanced panel ranging from 130 hospital trusts in 2013 to 128 hospital trusts in 2017 (which was due to organizational mergers). In total, our estimations used 642 trust-level observations.

To analyse our composite database, we used a method which tries to replicate the same logic of a clinical experiment or what is usually referred to as a routine clinical trial (RTC) (Austin, 2011, p. 399). Accordingly, we first split our sample of hospital trusts into two general categories: one with a high proportion of medical leaders (hereafter MLs) in their SMTs, which we termed the 'treatment' group; and a second with a lower proportion of MLs (the 'non-treatment' group). Following this, we carried out further statistical tests to see if the hospital trusts in the treatment group (where there were more MLs involved in strategic decision-making) had better quality and safety outcomes, than those hospital trusts in the non-treatment group. Like a normal experiment (or RCT), this approach has the potential to evaluate whether a particular intervention, or treatment (increasing the presence of MLs in a SMT) has an effect (improving quality and safety), while controlling for other confounding factors that might have a bearing on the outcome. However, because this approach did not involve direct observations of SMTs in each trust nor allow us to control who was exposed to the treatment, it is best described as a quasi-experiment.

To apply this quasi-experimental approach, we proceeded in two stages. First, we needed to identify our treatment group and understand the particular conditions that might explain why hospital trusts were included in that group. In the NHS, there is a statutory requirement for all hospital trusts to employ a minimum of one medical director on their boards, although some may co-opt, at their discretion, a larger number (for example as non-executives or even as CEO). Accordingly, we defined the treatment group as hospital trusts which involved more than the statutory minimum of doctors in their SMTs (ML > 1 in an SMT). Following the logic of critical mass theory (Kanter, 1977), we assumed that increasing numbers of MLs (more than one) at the SMT level would have distinct consequences for the nature of decision-making and, ultimately, for quality and safety outcomes.

To classify the hospital trusts within our sample into treatment and non-treatment groups, we then employed a statistical technique called 'propensity score matching'. This technique makes it possible 'to design and analyse an observational (nonrandomized) study so that it mimics some of the particular characteristics of a randomized controlled trial' (Austin, 2011, p. 399). Specifically, it seeks to account for the observable characteristics of hospital trusts that fall into both the treatment and non-treatment groups, which might also have a bearing on differences in quality and safety outcomes (see below). To achieve this, we calculated the probability of having ML > 1 on the SMT (the treatment group) using a panel random effects probit estimation. In this analysis, we focused on characteristics (or predictors) such as the size of the trust, the number of units, the case-mix index, the proportion of the medical workforce, the total number of admissions, foundation trust status, teaching hospital status and specialist trust status. This gave us a 'propensity score' (the likelihood of being in the treatment group) for each hospital trust.

Following this, in the second stage, we investigated the relationship between being part of the treatment group (SMT with ML > 1) and quality and safety outcomes. For outcomes, as noted, we used two indicators of service quality and patient safety for each hospital trust: the overall patient experience score, and the rate of Clostridium difficile (C. diff) infections. This stage of the analysis included the predictors included in the estimation of the propensity score, as well as previous levels of performance, bed occupancy and location dummies. To account for possible endogeneity issues, due to reverse causality and reciprocal influences between the predictors, we adopted a time-series cross-sectional panel data design, including annual data for each hospital trust. Endogeneity is essentially the problem arising from variables in an empirical model simultaneously affecting (co-determining) each other, for example service quality and safety affecting the presence of doctors on SMTs. It can also take the form of variables in the empirical model being influenced by their values in previous years, for example previous performance levels affecting subsequent performance. In both cases, this could lead to biased estimations.

To perform this part of the analysis, we used a technique called the 'Generalized Method of Moments (GMM) system of equations' (specifically the Arellano-Bover/Blundell-Bond dynamic panel data estimator) (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). In simple terms, GMM represents a dynamic approach to analysing panel data spanning over multiple years (in our case, five years). It makes it possible to account for potential reciprocal influences (including reverse causality) between the dependent variable and the predictors in the model (for example between MLs on the board and hospital trust performance outcomes), as well as the effect of lagged variables (for example how far current hospital trust quality and safety outcomes are influenced by performance in previous years). Essentially, it is more effective in dealing with potential biases in the analysis.

Results

Table 1 reports the descriptive statistics of the sample used in the study and a definition of the variables employed. The mean size of a hospital trust was 713 beds, with an average workforce of around 4,723 employees. The ratio of the medical workforce to all staff stood on average at 12.48%; 85% of the observations were in the treatment group. Around two thirds of hospital trusts operated under the more autonomous foundation trust status, while a fifth were teaching trusts and less than a tenth belonged to the specialist trust category. We also controlled for potential multicollinearity (multiple correlation) among the variables employed, with the variance inflation factors not raising any concerns.

Table 2 presents the findings of the panel random effects probit regression used to determine the likelihood of having more than one ML on the SMT (the treatment group). Significant antecedents of this outcome included: foundation trust status, the operational complexity of the hospital trust management (using the number of units from which healthcare services are delivered as a proxy), and the proportion of the medical workforce to all staff. All three variables were significantly and positively associated with a higher probability of having a representation of MLs on SMTs beyond the statutory prescription. As explained, this balancing (propensity) score was then entered in the second stage regression analysis.

Table 1. Descriptive statistics ($N = 642$).

Variable	Definition	Mean	Median	Min.	Max.	SD
Patient experience	Patient experience	76.93	76.50	67.10	88.20	3.51
Infection rate	Infection rate	14.95	14.15	0.00	82.70	7.47
Strategic apex ML > 1	Dummy variable if more than one strategic apex doctor managers	0.84	1.00	0.00	1.00	0.36
Size	Natural log of total number of beds	6.41	6.49	3.95	7.63	0.62
Number of units	The number of units of a hospital trust	4.86	4.00	2.00	18.00	2.87
Case-mix index	Case-mix for each hospital trust divided by mean case-mix	1.00	0.19	0.04	10.83	1.45
Bed occupancy	The percentage of bed occupancy of a hospital trust	87.58	88.30	56.10	100.00	6.70
Admissions	Natural log of admissions deflated by case-mix	69.12	64.37	0.88	309.59	61.53
Medical workforce	Proportion of medical workforce to all staff	12.48	12.26	5.52	25.59	2.45
Foundation trust	Dummy variable for foundation trust status	0.66	1.00	0.00	1.00	0.48
Teaching trust	Dummy variable for teaching trust status	0.20	0.00	0.00	1.00	0.40
Specialist trust	Dummy variable for specialist trust status	0.09	0.00	0.00	1.00	0.29

Table 3 shows the results of the system GMM regressions. These revealed that 'treated' hospital trusts, with a critical mass greater than one ML involved at SMT level, had higher patient experience scores and lower infection rates (both at a statistically significant level of $p < 0.05$) than 'untreated' hospital trusts. The benefits of being in the treatment group were considerable, increasing the patient experience scores by 15 percentile points from the median value and reducing the infection rates by 15 percentile points from the median value. With regard to the other covariates, specialist trusts were associated with better patient experience as were 'busier' (in terms of patient admissions) hospital trusts. There was some indication that a higher case-mix was associated with higher patient experience scores. Unsurprisingly, we observed path dependency in year-on-year performance outcomes: meaning that high (low) performing hospital trusts tended to remain so.

Further post hoc estimation specification tests confirmed the main findings, including a test to overrule a second-order serial correlation in the first differenced residuals (Arellano & Bond, 1991) and the difference-in-Hansen test for the levels equation for both the full set of instruments and the subset based on the relevant dependent variable. To avoid possible instrument proliferation, where necessary we collapsed the instruments employed and ran the Sargan–Hansen test of over identifying restrictions to check the validity of the instruments (Roodman, 2009).

Discussion and conclusions

A key point of departure for this article was the observation that, while the evidence to support greater medical participation on the governing boards (and SMTs) of healthcare organizations has grown, it remains incomplete. Drawing on an unbalanced panel of acute care trusts in England over five years (2013–2017), the analysis shows that, while a minority of hospital trusts restricted the involvement of doctors in their SMTs to a single medical director, most had a larger representation (critical mass) of medical professionals. This greater participation was then associated with positive organizational outcomes focused on service quality and safety, substantially improving overall patient experience and lowering risks of infection.

Table 2. Panel random effects probit estimation for the likelihood of a hospital trust having more than one strategic apex doctor manager.

Variable	Coefficient
Size	0.302 [0.449]
Number of units	0.175** [0.080]
Case-mix index	-0.019 [0.074]
Medical workforce	0.268***[0.088]
Admissions	-0.000 [0.002]
Foundation trust	1.062***[0.396]
Teaching trust	-0.270 [0.697]
Specialist trust	0.946 [0.943]
Observations	642
Wald (chi^2)	17.88**

Notes: Clustered robust standard errors at the hospital trust level are in brackets. Significance at *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Estimation includes a constant, which is not reported for brevity.

These results mark a significant advance in research on the impact of medical leadership in strategic roles. On the one hand, they reinforce the conclusions of earlier work (Clay-Williams et al., 2017; Sarto & Veronesi, 2016), showing that medical leaders do appear to make a difference, notably for perceived quality and patient-risk related outcomes. However, our analysis also goes beyond this earlier work in two key respects.

The first contribution is in terms of the quality, range and completeness of the data sources used. While many previous studies relieved heavily on cross-sectional surveys from limited samples, our analysis focused on a sample covering almost the entire population of NHS acute care hospital trusts in England over five years. We also combined a mix of administrative data sources relating to both the human capital attributes of SMTs, organization-level characteristics and performance outcomes.

Second, the analysis presented here has a number of methodological advantages over previous studies. The propensity matching technique reduces estimation bias and supports the assumption of strongly ignorable treatment assignments (Qin et al., 2008): no potential confounders were omitted in our empirical model. Crucially, the propensity matching technique offers the possibility of getting closer to being able to draw causal conclusions from longitudinal data in observational studies. Furthermore, estimations run with system GMM (and relevant robustness tests) also make it possible to test causal relationships between the dependent variables and the main predictors while accounting for potential correlations between variables in the empirical model (endogeneity concerns) and persistent levels (path dependency) of performance across years. As such, the study helps to raise the level of confidence in the direction of causality between medical leadership and performance, dispelling earlier concerns about the research on this topic and assessments of the evidence base (Clay-Williams et al., 2017).

Theoretically, as suggested earlier, one might explain these results in terms of expert knowledge that medical

Table 3. Coefficients for System GMM estimations (performance measures are the dependent variables).

Variable	Patient experience		Infection rate	
First lag of the dependent variable	0.191***[0.054]	0.182***[0.053]	0.391***[0.059]	0.393***[0.064]
Strategic Apex ML > 1	1.075***[0.332]	0.994***[0.338]	-4.275** [0.018]	-4.151** [1.971]
Probability of Strategic Apex ML > 1		0.506 [0.806]		-2.216 [2.929]
Size	-0.391 [0.310]	-0.921 [0.965]	0.412 [0.342]	2.852 [3.683]
Number of units	0.181***[0.050]	0.098 [0.137]	0.348 [0.043]	0.689 [0.480]
Case-mix index	0.122* [0.066]	0.167* [0.094]	-0.373 [0.066]	-0.558 [0.468]
Bed occupancy	-0.024 [0.043]	-0.040 [0.037]	0.256 [0.033]	0.257 [0.264]
Admissions	0.005***[0.002]	0.006***[0.002]	-0.007 [0.002]	-0.012 [0.013]
Foundation trust	1.706** [0.803]	0.777 [1.603]	1.208 [0.805]	5.460 [6.203]
Teaching trust	0.479 [0.374]	0.512 [0.384]	0.164 [0.303]	-0.004 [1.161]
Specialist trust	6.612***[0.821]	5.350** [2.175]	5.181 [0.910]	10.421 [7.955]
SHA dummies	Yes	Yes	Yes	Yes
Observations	602	602	602	602
Number of groups	130	130	130	130
Number of instruments	55	63	55	63
Hansen test[a] (chi^2)	48.85 (0.06)	49.96 (0.19)	54.04 (0.02)	57.62 (0.06)
Ar(2)[b] (z)	-0.51 (0.61)	-0.49 (0.62)	1.23 (0.22)	1.17 (0.24)
Diff-in-Hansen test[c] (chi^2)				
Full set	45.04 (0.04)	45.85 (0.13)	48.21 (0.02)	51.37 (0.05)
Subset	3.81 (0.67)	4.11 (0.66)	5.83 (0.32)	6.25 (0.40)
Wald (chi^2)	918.60***	807.62***	151.57***	161.25***

Notes: Clustered robust standard errors at the hospital trust level are in brackets. All estimations include constant and strategic health authority (SHA) dummies, which are not reported due to space reasons. [a]In the Hansen test, the null hypothesis is that the instruments as a group are exogenous. [b]In the Arellano-Bond test, the null hypothesis is that the errors in the first-difference equation do not have second-order serial correlation. [c]In the Difference-in-Hansen test, the null hypothesis is that the instrument subset is exogenous. Difference-in-Hansen test statistics are presented for the levels equation for both the full set of instruments and the subset based on the dependent variables; *p* values are in parentheses for Hansen, Arellano-Bond and Difference-in-Hansen tests. Significance at $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

leaders on SMTs have of the core business of healthcare and their credibility. When there is a greater critical mass of doctors, these characteristics will help to improve both the quality of decision-making and the likelihood that decisions will be implemented. With greater strength in numbers, medical leaders may also have a better chance of exercising voice and ensuring that concerns about patient wellbeing and quality receive a higher profile than might otherwise be the case.

Limitations and future research

Of course, the study is not without limitations and highlights important directions for future research. Most obviously, it would be paramount to understand the implications of medical leadership in primary care organizations. In addition, more work is needed to look at other NHS organizations, such as mental health trusts or even ambulance trusts where doctors are less well-represented in senior management. Furthermore, while this research helps to advance the evidence base regarding medical leadership and performance, a potential weakness is the inability to explain precisely *why* these relationships hold. As noted, it seems theoretically logical to assume that greater medical involvement in senior management produces these results because of their deep knowledge of healthcare, credibility and social capital within relevant networks. However, it is only possible to impute this from our analysis. Going forward, qualitative research methods, in a small number of cases, to explore how medical leaders enact their roles in situ, might be useful to address this concern.

Related to this are questions about the role and impact of senior managers with other clinical backgrounds, such as nurses or allied healthcare professionals. In the current study, we were unable to test for this due to limitations in the Database of NHS Management which does not identify nurses (or other allied healthcare professionals) at the board level. Earlier research using alternative sources (over a shorter time period) finds that the proportion of nurse directors has no direct impact on hospital quality outcomes (Veronesi et al., 2013). However, it may be that the interaction with other clinicians, including challenging or reinforcing the dominant medical perspective, has indirect consequences for performance (Prybil, 2006). This is also consistent with the notion of distributed leadership (West et al., 2014) and by research that has emphasised the importance of boards that are more heterogeneous or diverse in their membership (Blanco-Oliver et al., 2018). Lastly, it would be interesting to explore the impact of management training and development. A key issue here is whether the presence of doctors on boards alone is what makes the difference to outcomes, or if this only applies to those who have prior management experience, training and qualifications. Evaluations of the impact of management development in healthcare reach similar conclusions (Geerts et al., 2020), although clearly we need to know more about this.

Lessons for international practice

Turning to practical implications, for medical professionals, our study lends support to those who argue that medical leadership represents an important and legitimate field of activity and could be 'a positive development from a societal and public interest perspective' (Ferlie, 2018, p. 278). Historically, the occupational culture of medicine has fostered a general 'wariness of managerial work' (Blumenthal et al., 2012, p. 515). Even when this is not the case, doctors may relegate management to a secondary concern, or even view it as a costly distraction that pulls them away from their core medical roles and careers. However, the findings reported here paint a different picture. While involvement in management is undoubtedly challenging for doctors—especially when it is not recognized or rewarded—the research shows that it can add significant value where patients are concerned, in

terms of both perceived quality and safety. By highlighting the real impact that medical leaders have, this key finding may help to raise their profile among a wider constituency of clinical professionals.

For policy-makers, these results may further reinforce messages about the usefulness of investing the training and development of medical leaders (Geerts et al., 2020). They also highlight the potential for more direct forms of human resource and succession planning. Given the significant performance enhancing effects of increasing the number of doctors on SMTs, finding new ways in which to encourage this and actively plan careers could pay important dividends. For most healthcare organizations, this would also be a relatively inexpensive policy, especially when assessed against the risks of weak medical engagement (Ham et al., 2011). In the English NHS, there are currently no formal guidelines which encourage this type of active workforce planning for doctors or help in supporting alternative career paths (Bresnen et al., 2019). Yet, from the evidence now available, it seems that such guidance is long overdue, as even relatively small adjustments to workforce planning at the top can have marked consequences for patient care and wellbeing. Indeed, this aligns with observations made in the recent Messenger Review of NHS leadership (DHSC, 2022), which stated that the 'medical profession does have a unique responsibility for leading behavioural change where necessary and supporting a positive culture within their sector where all staff flourish'.

Healthcare systems across the world are at a crossroad due to increasing financial pressures, exponential growth in demand for services and persistent shortages of skilled labour. The answer to these issues is intuitively multifaceted and requires a concerted effort from policy-makers, practitioners and service users. It is, therefore, paramount for the medical profession to provide the leadership needed to navigate through a future of healthcare systems replete with uncertainty and risk.

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