The Impact of Management on Hospital Performance

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June 1, 2020

Abstract

Background: There is a prevailing popular belief that expenditure on management by healthcare providers is wasteful, diverts resources from patient care, and distracts medical and nursing staff from getting on with their jobs. There is little existing evidence to support this narrative or counter-claims.

Methods: We explore the relationship between management and public sector hospital performance using a fixed effects empirical econometric specification on a panel data set consisting of 97 non-specialist acute National Health Service (NHS) hospitals in England for the financial years 2012/13 to 2018/19. Measures of managerial input and quality of management practice are constructed from NHS Electronic Staff Records and NHS Staff Survey data. Hospital accounts and Hospital Episode Statistics data are used to construct five measures of financial performance and of timely and high quality care.

Results: We find some evidence that hospitals with more managers are more likely to achieve elective waiting targets and treat more patients. There is no evidence of an association between either the amount or quality of management input for the other measures of hospital performance.

Conclusion: There is limited variation in managerial input across NHS hospitals and managers have limited discretion in performing their managerial functions, being tightly circumscribed by official guidance and externally imposed targets. Given these constraints, the lack of strong evidence of associations between managerial input and NHS hospital performance is unsurprising.

Keywords: Personnel Management; Analysis of Health Care Markets; Firm Performance: Size, Diversification, and Scope; Panel Data Models; Labor Force and Employment, Size, and Structure

JEL Classification: M12, I11, L25, C33, J21

NOTE: This preprint reports new research that has not been certified by peer review and should not be used to guide clinical practice.

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1 Introduction

Management matters, apparently. In theory, organisations that are better managed have staff that are more motivated and attuned to organisational objectives. As a consequence, these organisations ought to be more successful in pursuing their objectives than otherwise similar organisations that are less well managed. For private sector organisations evidence appears to support the theory of management matters (Bloom and Van Reenen, 2007). But when it comes to public sector organisations, governments play a significant role in determining how management is constituted, how managers are paid and what they are tasked to do. This is true for the English National Health Service (NHS), in which hospitals have faced sustained governmental pressure to reduce the number of managers and to limit their remuneration. In such settings, where management is perceived to be more an administrative than an entrepreneurial function, it is unclear how much management matters.

In this paper we assess whether there is a relationship between managerial input and hospital performance in the English NHS. In order to do so we create measures of the amount and quality of managerial input as well as a collection of indicators against which to assess hospital performance.

There is a large body of work exploring the contribution of management to the performance of private sector organisations (Bloom and Van Reenen, 2011) and (Bender et al., 2018). Private sector managers are employed by owners or shareholders primarily, if not exclusively, to improve profitability. Private sector organisations wishing to do better seek to attract better managers, offering them generous financial incentives. Senior managers are well-paid, and often there is a large pay gap with other staff in the organisation. Larger incentives are assumed to both attract better managers and, if appropriately structured, induce them to work harder (Murphy, 1999). Managers are granted authority over staff, allowed to make hiring and firing decisions, given considerable autonomy in their day-to-day decision making, and encouraged to take risks if these bring the promise of future financial rewards (Ichniowski et al., 1997).

The role of NHS hospital managers is quite different to those in the private sector. For one thing, there are not very many hospital managers. Approximately 3% of staff in NHS hospitals are employed in management roles as compared to 11% of staff employed in management roles in the economy overall in England (Office for National Statistics, 2018). Nor are NHS managers particularly well-paid compared to those working in the private sector or relative to the other staff in their organisation (Janke et al., 2018).

Managing NHS hospitals is complicated and managers are more circumscribed in their role than private sector counterparts. NHS hospitals do not have owners or shareholders, but serve the interests of multiple stakeholders, and typically are not driven to maximise profits, but rather have to balance the pursuit of multiple, perhaps conflicting, objectives (Dixit, 2002) and (Burgess and Ratto, 2003). Managers have limited authority within the hospital where clinicians make most of the key decisions about what the hospital does and how it goes about doing it, with managerial influence relying less on authority and more on persuasion (Harris, 1977). Risk-taking is discouraged, the managerial task being to ensure that things run smoothly.

In this context, the relationship between the degree of managerial input and performance is likely to be tenuous at best, if evident at all. Previous studies in this area have modelled hospital output as a function of capital, physicians and management input. Management input is conceived either as a distinct staff group in the hospital production function, as in Street et al. (1999) and Soderlund (1999), or as a way to influence total factor productivity, as in Bloom et al. (2016). Thus far these approaches have found very little association between the degree of management input and hospital output. This conclusion also seems to be borne out by the limited literature exploring the relationship between the managerial pay and hospital performance. In a study of non-profit US hospitals (Joynt et al., 2014) found no correlation between chief executive officer (CEO) compensation and patient outcomes. (Janke et al., 2018) confirm these findings in their study of NHS hospitals, finding that CEOs, regardless of their level of remuneration, appear to have no discernible effect on any of a wide range of hospital performance measures.

Other studies have attempted to assess the quality of hospital management, and have found this to be related positively to hospital performance. As part of their work on global management structures (Bloom et al., 2012)
surveyed clinical practice leads in cardiology and orthopaedic departments in hospitals across several countries and found an association between higher quality management and lower risk-adjusted hospital mortality from acute myocardial infarction (AMI). A similar conclusion was reached by Bloom et al. (2015) where, based on interviews of managers in orthopaedic and cardiology departments within UK hospitals, higher management scores were associated with improved AMI survival rates, improved survival rates from general surgery, shorter waiting times and a decrease in staff turnover.

We advance this literature in four main ways. First, we exploit a relatively new workforce dataset that identifies the type and amount of staffing input used by all NHS hospitals. Previous NHS studies drew upon the annual workforce census (WC), that took an annual snapshot of those working in the NHS. We utilise the monthly electronic staff record (ESR), an integrated human resources and payroll system that contains data for 1.4 million NHS employees. The ESR is comprehensive, capturing everybody on the payroll, and is highly granular, with staff categorised into 538 separate groups, each of which can be further split by pay-grade. We use the ESR to derive an accurate measure of the number of managers and clinicians employed by NHS hospitals.

Second, we measure of the quality of management by drawing upon information in the NHS staff survey. This is the largest workforce survey in the world, built on the responses from approximately 500,000 staff per year, in which staff answer a series of questions about the quality of management in their organisation.

Third, we do not confine our analysis to a single measure of hospital performance. Instead, recognising that NHS hospitals are tasked to pursue multiple objectives, we consider five indicators, capturing financial performance and measures of timely and high quality care.

Finally, where previous studies in this area have tended to analyse cross-sectional data, we construct and analyse a panel data set for NHS hospitals covering seven years from 2012/13 to 2018/19. The dataset contains a heterogeneous group of hospitals varying in a range of dimensions not directly captured in the data. We use our panel data together with hospital fixed effects to control for this unobserved heterogeneity.

In the remainder of this article we define our measures of management quantity and management quality and describe how we construct these measures, introduce our empirical specification, report our key results and conclude with a discussion and interpretation of our findings.

2 Methods

2.1 Data

Our analysis focuses on non-specialist acute NHS hospitals (termed “NHS trusts”) operating in England in the financial years 2012/13 to 2018/19. There are 129 acute hospitals but, for our main results, to protect against data quality issues, we restrict this sample by excluding the 5% of hospitals with the highest and lowest percentage of managers as a proportion of all staff in each year. We additionally exclude those hospitals that did not have data on all five outcomes that we modelled in the analysis. This left a final sample of 97 acute hospitals, listed along with key descriptive statistics in the supplementary appendix.

As well as analysing the entire period, we conduct additional analyses from 2016/17 to 2018/19, these being the years with the richest data. The descriptive statistics given in the remainder of the manuscript are based on the most recent year of data (2018/19). Descriptive statistics and analytical results for the other years of data, and those for the full sample of 129 acute hospitals and the 17 specialist hospitals are given in the supplementary appendix.
2.1.1 Quantifying the number of managers

There is no agreed measure of managerial input and it is a challenge to establish how best to assess the form, quantity and quality of hospital management and to differentiate general administrative functions from clinical management. This work benefits from using the NHS electronic staff record (ESR) to measure staffing, the ESR being an output of the IT system used to manage human resources in the NHS. The monthly data published from the ESR captures staff role, fulltime equivalents (FTE) of all permanent NHS staff, including managers and senior managers, and, from 2016/17, pay grade. The inclusion of pay grade offers two advantages to our analyses. First, we are able to construct a measure of expenditure on management and, second, we are able to more precisely identify those performing managerial rather than administrative roles. For these reasons we have undertaken analyses both for the full data series and for the years from 2016/17.

We construct three measures of the number of managers. The first measure, referred to as \( M_1 \), can be constructed for all years in the series and is a simple count of the number of full-time equivalent (FTE) managers in each hospital. Hospitals with more managers might be better managed.

For the full series we identify managers as those staff in post in September, midway through the financial year, having the word “manager” or “senior manager” as their primary job title. From 2016/17 job descriptions in ESR were reported in much greater detail allowing us to identify 538 distinct non-medical roles as compared to just 19 before this date. Using this greater level of detail we are able to adopt a more precise second definition of the number of managers referred to as \( M'_1 \), by including those staff with senior managerial responsibilities but without having the word “manager” in their job title. We also use the pay grade data available from 2016/17 to limit identification of those with managerial roles to those employed on Agenda for Change grade 7 or above, as those below this grade have mainly administrative responsibilities (NHS Digital, 2018). This more precise definition thus includes nurse managers but excludes junior staff who are likely to be in administrative positions. In 2018/19 the ESR recorded a total 531,510 of FTE staff in the 97 acute NHS hospitals. Of these, 12,238 had manager or senior manager in their primary job title (\( M_1 \)) and 16,486 (3.1%) are identified as managers if we adopt our more precise definition (\( M'_1 \)) to identify managers (see figure 1).

An important caveat is that medical staff who may have management responsibility, such as senior doctors (known as “consultants” in the NHS) who constitute 5.2% of the workforce, are not included in these manager numbers.

Figure 1: Managers by staff type in 97 acute NHS hospitals in 2018/19

![Figure 1: Managers by staff type in 97 acute NHS hospitals in 2018/19](image)

Note: excludes managers employed below agenda for change grade 7

The third measure, referred to as \( M_2 \), weights the number of FTEs at each managerial grade by the associated pay rate. This measure could be constructed only from 2016/17, when the ESR included pay grade. Theoretically, pay should reflect the marginal product of labour, with higher paid managers receiving rewards commensurate with their contribution (Murphy, 1999). Hospitals that offer more generous pay packages would expect a greater performance return from their better paid managers.
2.1.2 Capturing the quality of management

While the assumption that managerial pay reflects the marginal product of labour might hold in competitive labour markets, it might not in the NHS, where there is centralised pay bargaining. This opens up the possibility that the best managers may not be the highest paid. Recognising this, we supplement our measures of the quantity of management with a measure of managerial quality, as reported by NHS staff.

This information comes from the NHS staff survey, which is the largest workforce survey in the world and has been conducted every year since 2003. In the 2018/19 wave of the staff survey [Staff Survey Coordination Centre 2018] around 1.1 million NHS employees were invited to complete the survey of which some 500,000 responded (a response rate of 46%). Responses were scored on a scale from 0 to 4 corresponding to answers: Strongly disagree (0), Disagree (1), Neither agree nor disagree (2), Agree (3), Strongly agree (4).

There were 11 questions on the staff survey that focused specifically on management – 7 on immediate managers and 4 on senior managers (see supplementary appendix for the full list of these questions). We normalised the score for each of the 11 questions on a percentage scale and then averaged across all the questions to produce an overall measure of managerial quality for each NHS hospital, referred to as $M_q$.

Figure 2: Distribution of management input variables across 97 acute NHS hospitals in 2018/19

The distribution of our management quantity variables $M_1$ and $M_2$ as well as our management quality variable $M_q$ measured across our sample of 97 NHS acute hospitals in 2018/19 are shown in figure 2. There is variation in both quantity and quality of managerial input. Managers make up between 1% and 5% of the hospital workforce and account for between 1% and 4% of total operating costs. The consolidated management score derived from the NHS staff survey ranges from 56% for the lowest scoring hospitals to above 70% for the highest scoring hospitals in our sample.

2.1.3 Outcome measures

While it is generally accepted that private sector organisations are interested primarily in maximising profit, there is no single objective that not-for-profit or public sector organisations aim to achieve. Hospitals pursue
multiple objectives, but there is no consensus on what these are. In our analysis, we measure hospital performance using five indicators. The first indicator is a measure of financial performance while the remainder capture the hospital’s mission to deliver timely and high quality care to those in need of treatment.

Figure 3: Distribution of hospital outcome variables across 97 acute NHS hospitals in 2018/19

Financial performance is measured by *net financial position*, this indicator is derived from the hospital’s annual accounts. A positive value indicates that total hospital revenues exceed total operating costs. Timely care is captured by two indicators, both used by the English government to monitor hospital performance. The *elective waiting time* measures the proportion of patients who are treated within 18 weeks of being referred by their general practitioner for a planned hospital admission. The *A&E waiting time* measures the proportion of patients in accident and emergency (A&E) who are seen within 4 hours.

The last two indicators capture the quantity and quality of care that the hospital provides. The number of *inpatient admissions per senior doctor* measures the total number of patients (measured as “finished consultant episodes”) at each hospital. This is derived from the Hospital Episode Statistics data averaged over the total number of senior doctors in the hospital (from 2016/17 - excluding those in the emergency department who are not directly responsible for admitted patients). The *Summary Hospital-level Mortality Indicator* (SHMI) reports the ratio between the actual number of patients who die following hospitalisation and the number that would be expected to die on the basis of case mix adjusted average England figures. The SHMI is the official mortality indicator for acute hospitals in England, with values greater than one indicating worse than average performance.

The distribution of these five performance indicators across the 97 acute NHS hospitals in our sample for financial year 2018/19 are plotted in figure 3. There is variation in each of the indicators, with evidence of poor performance: the majority of hospitals (63%) are in deficit; all hospitals fail to ensure that all of their patients are treated within 18 weeks of referral; most hospitals fall well below the target that 95% of A&E patients are seen within fours hours; and the SHMI is worse than expected for 54% of hospitals.
2.1.4 Controls

The ability of management to influence performance may depend on the size of the hospital, if there are scale effects, and the diversity of activity, if there are scope effects. We capture differences in hospital size using four measures: the total number of beds in the hospital; the number of patients admitted over the year; the total operating cost; and the number of senior doctors. The diversity of activity is captured by proportions of inpatient hospital admissions by age-group and sex.

Figure 4: Distribution of control variables across 97 acute NHS hospitals in 2018/19

Figure 5: Relationship between management input and resources to be managed across 97 acute NHS hospitals in 2018/19

In the analysis we divide each of the size measures by the number of managers employed by the hospital to get an impression of how intensely these are managed. We plot these against the proportion of staff working in managerial positions at each hospital in Figure 5. The negative slopes in this figure indicate that as the proportion of staff working in managerial positions increases then, on average, each manager is responsible for fewer beds, fewer admitted patients, and a decreasing amount of expenditure. This suggests that those hospitals employing more managers are managing these resources more closely than those with fewer managers.

2.2 Empirical specification

We use ordinary least squares (OLS) and analyse each indicator separately, thereby avoiding having to construct a composite index. We consider a quadratic form in which managerial input is introduced as a linear and a squared term in the spirit of Street et al. (1999). For any particular performance indicator, the quadratic equation is
There is no evidence of an association between managerial quality and any performance measure. This suggests that hospitals with more managers $M_1$ have a greater proportion of patients treated within the elective waiting time target period. There is no evidence of an association between managerial quality $M_q$ and any performance measure.

Table 2 shows results when applying the more precise definition of $M'_1$ to the last three years of data. The association with the elective waiting time target is no longer significant. Instead there is a statistically significant ($p < 0.01$) association between $M'_1$ and the number of inpatient admissions per senior doctor. For this outcome an additional manager for the average hospital - having 170 managers (FTE), 272 senior doctors, and 562 admissions per senior doctor - is associated with 0.141 additional admissions per senior doctor or 38 additional admissions for the hospital overall.

\[
(p_1 \times 171 + p_2 \times 171^2) - (p_1 \times 170 + p_2 \times 170^2) = 0.141
\]

\[
\text{where} \quad p_1 = -0.541; \quad p_2 = 0.002
\]

\[
0.141 \times 272 = 38
\]

For the other four outcomes neither the measure of management quantity $M'_1$ nor the measure of management quality $M_q$ have a statistically significant impact.
In qualitative terms the results in table 3 are similar to those in table 2 in which $M'_1$ is substituted for $M_2$. This is unsurprisingly given the high correlation between these two measures ($\rho = 0.99$).

We conducted robustness checks to examine whether the results were stable across different model specifications, the results of which are presented in the supplementary appendix. We estimated cross-sectional models for each year of data to explore the importance of period specific effects, and pooled models across all years without fixed effects to see if the increase in degrees of freedom this yields helps to uncover significant results. We specified log form models to explore non-linear relationships between management and performance and models with lagged dependent variables to control for reverse causality. Results are robust to these alternative specifications with one exception: when hospital fixed effects are omitted, the management quality variable $M_q$ has a significantly positive association with better performance. This significant association may reflect the lack of temporal variation in management quality within hospitals, with the association disappearing when fixed effects are included.

We have produced an interactive data exploration tool where: alternative measures of management can be defined; a wide range of alternative variables can be used as model inputs, outputs, and controls; and various model specifications can be tested. The tool can be accessed at the following url: https://miqdad.freeasinspeech.org.uk/hospital_management/
Table 1: Amount of managerial input and hospital performance, 2012/13 – 2018/19

| Dependent variable: | Net financial position (£ million) | Elective waiting time target met (%) | A&E waiting time target met (%) | Inpatient admissions per senior doctor | Summary Hospital-level Mortality Indicator |
|---------------------|----------------------------------|-------------------------------------|---------------------------------|----------------------------------------|------------------------------------------|
|                     | (1)                              | (2)                                 | (3)                             | (4)                                    | (5)                                      |
| Number of managers ($M_1$) | 0.051 (0.075)                    | 0.038* (0.015)                      | −0.005 (0.023)                  | −0.350 (0.157)                         | −0.0003 (0.0002)                         |
| Number of managers squared ($M_1^2$) | −0.0002 (0.0002)                 | −0.00003 (0.00003)                 | 0.001* (0.0003)                 | 0.00000 (0.00000)                     |
| Quality of management ($M_q$) | 0.122 (0.407)                    | −0.053 (0.097)                     | 0.101 (0.113)                   | −0.579 (0.722)                         | 0.0003 (0.001)                           |
| Observations | 731                              | 731                                 | 731                             | 731                                    | 731                                      |
| $R^2$ | 0.118                            | 0.047                               | 0.053                           | 0.057                                  | 0.036                                    |
| Adjusted $R^2$ | −0.088 (0.238)                   | −0.176 (0.040)                     | −0.108 (0.049)                  | −0.168 (0.205)                         | −0.176 (0.005)                           |
| F Statistic (df = 15; 592) | 5.284** (1.931)                  | 2.217** (1.931)                    | 52.424** (52.424)               | 2.437** (2.437)                        |

All equations include hospital and year fixed effects and the following control variables: Numbers of senior doctors, beds, total operating costs, and number of inpatient admissions split by age and sex.

*p<0.05; **p<0.01

Table 2: Amount of managerial input and hospital performance, 2016/17 – 2018/19

| Dependent variable: | Net financial position (£ million) | Elective waiting time target met (%) | A&E waiting time target met (%) | Inpatient admissions per senior doctor (excluding A&E) | Summary Hospital-level Mortality Indicator |
|---------------------|----------------------------------|-------------------------------------|---------------------------------|--------------------------------------------------------|------------------------------------------|
|                     | (1)                              | (2)                                 | (3)                             | (4)                                    | (5)                                      |
| Number of managers ($M_1'$) | 0.038 (0.228)                    | 0.015 (0.040)                       | 0.027 (0.049)                  | −0.541** (0.265)                         | −0.0001 (0.0005)                         |
| Number of managers squared ($M_1'^2$) | 0.0001 (0.0001)                 | −0.00001 (0.0001)                  | −0.0001 (0.001)                 | 0.002** (0.001)                         | −0.00000 (0.00000)                     |
| Quality of management ($M_q$) | 0.180 (0.597)                    | 0.026 (0.214)                      | 0.336 (0.195)                  | −0.040 (1.244)                         | 0.001 (0.003)                           |
| Observations | 291                              | 291                                 | 291                             | 291                                    | 291                                      |
| $R^2$ | 0.128                            | 0.111                               | 0.081                           | 0.724                                  | 0.088                                    |
| Adjusted $R^2$ | −0.129 (1.729)                   | −0.156 (1.479)                     | −0.506 (1.037)                 | 0.547                                  | −0.495                                  |
| F Statistic (df = 15; 177) | 1.729** (1.729)                  | 1.479 (1.479)                      | 1.037 (1.037)                  | 30.885** (30.885)                       | 1.132                                    |

All equations include hospital and year fixed effects and the following control variables: Numbers of senior doctors, beds, total operating costs, and number of inpatient admissions split by age and sex.

*p<0.05; **p<0.01
| Dependent variable: | Net financial position (£ million) | Elective waiting time target met (%) | A&E waiting time target met (%) | Inpatient admissions per senior doctor (excluding A&E) | Summary Hospital-level Mortality Indicator |
|---------------------|-----------------------------------|-------------------------------------|---------------------------------|-----------------------------------------------------|-----------------------------------------|
|                     | (1)                               | (2)                                 | (3)                             | (4)                                                 | (5)                                     |
| Spend on managers in £ million (M₁) | 1.580                             | 0.224                               | 0.480                           | −10.486*                                            | −0.004                                  |
|                     | (0.471)                           | (0.66)                              | (0.597)                         | (4.091)                                             | (0.009)                                 |
| Spend on managers in £ million squared (M₂) | −0.00000                          | 0.000                               | −0.00000                        | 0.00000**                                           | 0.000                                  |
|                     | (0.00000)                         | (0.00000)                           | (0.00000)                       | (0.00000)                                           | (0.000)                                |
| Quality of management (M₃)    | 0.186                             | 0.026                               | 0.342                           | −0.087                                              | 0.001                                  |
|                     | (0.999)                           | (0.192)                             | (0.226)                         | (1.177)                                             | (0.002)                                |
| Observations        | 291                               | 291                                 | 291                             | 291                                                 | 291                                     |
| R²                  | 0.117                             | 0.115                               | 0.089                           | 0.726                                              | 0.086                                  |
| Adjusted R²         | −0.431                            | −0.450                              | −0.493                          | 0.552                                              | −0.497                                 |
| F Statistic (df = 15; 177) | 1.789                             | 1.531                               | 1.153                           | 31.341***                                           | 1.111                                   |

All equations include hospital and year fixed effects and the following control variables: Numbers of senior doctors, beds, total operating costs, and number of inpatient admissions split by age and sex.

*p<0.05; **p<0.01
4 Discussion

We find some evidence that hospitals with more managers are more likely to achieve elective waiting targets and treat more patients. But this evidence comes with caveats. The impact on waiting is evident when managers are identified on the basis of “manager” appearing in their job title, but not when the more precise definition on managerial input is applied to the latter three years of data. For these latter years but not the full series, the analysis indicates that an increase in the number of managers is associated with slightly more inpatient admissions per senior doctor. The mechanism underpinning this may be that more managerial input might enable doctors to work more efficiently or encourage them to work harder. However, the observed association may indicate endogeneity: hospitals that treat more patients earn more revenue allowing them to employ more managers. We are unable to identify the direction of causality between managerial input and patient numbers.

There is no evidence of an association between either the amount or quality of management input for the other three measures of hospital performance. This holds irrespective of how we define managerial input, whether by number of managers, expenditure on management, or quality of management. The conclusion is also robust to how we specify the functional form of the relationship between performance and managerial input, which control variables we include, and the choice of which years of data to analyse.

One reason for the lack of an association is that, unlike their private sector counterparts, NHS managers have little discretion in how they perform their roles. They are required to implement official instructions and to meet externally imposed targets. This reduces management in the NHS to largely an administrative function, entailing following bureaucratic processes that allow the adoption of NHS wide best practice guidelines. This is very different to the role of management in the private sector where managers typically have more autonomy, and enjoy considerable authority in deciding key objectives and in optimising their firm’s production processes.

Another reason why there is little association between NHS management and performance is that there is little variation in managerial input across NHS hospitals. The number of managers is largely determined by the administrative tasks that need to be fulfilled and the scope of management circumscribed to these well defined tasks. Similarly, there is limited variation in the remuneration of NHS managers, hospitals being constrained in what pay packages they can offer. These factors leave little room for exceptionally good managers to shine or exceptionally bad managers to do much damage to overall hospital performance.

It may also be the case that the numbers of managers varies among hospitals for reasons unrelated to performance. These reasons include the number of sites across which the hospital is spread and the range and types of services offered to patients. Much of this variation is time-invariant between-hospital heterogeneity and so swept up by the fixed effects used in our analysis. Given the above considerations and after controlling for both observed and unobserved heterogeneity across hospitals, the lack of a systematic association between levels of management input and hospital performance is not surprising.

Our study has a number of strengths compared to previous studies on the subject. Firstly, we make use of the ESR, which captures payroll data on everybody employed by the NHS, and from which we are able gain an accurate assessment of how many people were employed as managers and what pay scale they were on. Accuracy improved in the later years, when job roles in the ESR were reported in much greater detail.

Secondly, we capture the quality of management practice based on the NHS staff survey which includes responses of approximately 500,000 staff per year - the largest workforce survey in the world. Previous work in this area has measured the quality of management practices using telephone interviews with small numbers of staff in management positions within hospitals see [Bloom et al. (2012)] and [Bloom et al. (2015)]. Our use of the survey allows us to build a panel of data on management practices as interpreted by a much wider range of staff and to capture changes over time within hospitals.

Thirdly, we analyse seven years of data for a sample of 97 non-specialist acute NHS hospitals and run a fixed effects model on this data set to control for unobserved heterogeneity between the hospitals. Previous studies have typically employed cross sectional analyses on a single year of data [Tsai et al. (2015)] and [Bloom et al. (2015)]. These studies show a strong positive correlation between quality of management practices and hospital
performance [Bloom et al. (2015)]. We include cross-sectional analyses in the supplementary appendix and also see substantial and significant coefficients with our management practices variable \((M_q)\) for each of the outcomes. However, in the panel data analyses these effects disappear. This suggests that either these practices are largely time invariant and so swept out by the hospital fixed effects or that they are confounded by other time invariant unobserved factors in the cross-sectional analyses that the hospital fixed effects account for.

Finally, we use SHMI as our main clinical outcome variable - covering mortality across all specialities in the hospital. Previous studies have focused solely on acute myocardial infarction deaths, giving a partial view of this aspect of clinical performance [Bloom et al. (2015)].

Of course our study has limitations. Firstly, the data we use does not detail the extent to which senior doctors are involved in management, so these doctors have been omitted from the management measures we construct. Secondly, whilst our empirical approach controls for unobserved time invariant heterogeneity between hospitals it is not able to capture the effect of any unobserved time varying heterogeneity between hospitals. Such effects may arise if unobserved hospital characteristics influence changes in the number and type managers that are employed. For example additional managers may be appointed to help deliver service expansions.

Our results are at odds with the literature on management practices which measures how well operations are managed, how well performance is monitored, how targets are set, how well leadership is demonstrated, and how well talent is managed. However, our findings are consistent with previous studies [Street et al., 1999] and [Soderlund, 1999] that find little evidence of a clear positive relationship between managerial input and hospital performance in the NHS. In the face of allegations that additional spend on NHS management is wasteful, diverts resources from patient care and distracts clinical staff from doing their jobs, any additional spend on management by healthcare providers needs to be carefully justified [Graeber, 2019].

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