Does Leadership Matter for Healthcare Service Quality?

Evidence from NHS England

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Abstract

In this paper, we provide first-hand evidence that leadership quality matters for the quality of healthcare provision, based on NHS England hospital trust data between 2010 and 2014. This is the first paper to study this relationship using individual leadership styles, namely, task-, relations-, change- and integrity-oriented as independent variables and four different metrics of quality of healthcare as dependent variables, including staff and patient satisfaction survey measures and clinical performance indicators. We find that task-oriented leadership has the strongest effect on staff-rated hospital quality while change-oriented leadership affects most patient satisfaction and the clinical measure. We also find some evidence that organizational autonomy and competition across hospitals moderates the effect of leadership quality on healthcare quality. Overall, our results have important policy implications for continued support for the development and funding of integrated leadership programs in healthcare.

Keywords: Healthcare Leadership, National Health Service, Public Service, England

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INTRODUCTION

In almost every country, health-care costs have been rapidly rising, which has led to a great policy emphasis on improving the effectiveness of healthcare providers. One possible way to achieve this is through improving leadership quality, as high quality leaders will deliver effective services (Awamleh and Gardner 1999). The essence of leadership in organizations lies in affecting and coordinating individual and collective efforts to accomplish and reach shared objectives. A century of research into leadership has generated strong evidence that an organization's success depends upon its managers' leadership (Wang et al. 2011; Behrendt et al. 2017). Nevertheless, there is still a need for rigorous empirical research on the impact of leadership in public sector organizations, given the limited amount of research on the topic, (van Wart 2013) and especially in the public healthcare sector. Our paper aims to fill this gap by asking whether leadership quality can predict organizational outcomes in the healthcare sector. Adopting an already existing taxonomy on effective leadership behaviors we test whether leadership quality in terms of task-, relations-, change- and integrity-oriented leadership affect public hospital service quality. We concentrate on the special case of acute secondary care-providing hospitals in the English National Health Service (NHS) and focus on leadership at all levels of organizational hierarchy from team leaders to senior executives. We achieve this by compiling a unique data set from various publicly available sources covering the recent five year period and using advanced statistical techniques to test our hypotheses.

Healthcare, and especially the English NHS, is a crucial context in which to explore the link between leadership and service quality. First, hospital outcomes are critically important, as improving quality and minimizing variations in health services are one of the most important objectives of governments and societies as a whole. Second, there is a gap in our understanding of the impact of different leadership styles on healthcare outcomes and validating leadership theories in the healthcare context is a step forward in scientific advancement. Third, we respond to the debates on the nature and

effectiveness of leadership in healthcare organizations where significant financial and non-financial resources are spent on leadership development (Ham 2012; Storey and Holti 2013).

The reforms implemented within the English NHS during the last decade have increased competition and the autonomy of health organizations. This has granted healthcare leaders more control over the administration and regulatory procedures, thus allowing us to assess whether the effect of leadership quality on healthcare service quality is moderated by organizational autonomy and competition. It is now commonly accepted that leadership development in the healthcare sector is beneficial for health service quality (King's Fund, 2012; Macfarlane et al. 2012), and yet there is a dearth of scientific research in this area. With very little existing scientific evidence on the effects of leadership quality on the quality of healthcare services, it is still arguable whether public resources spent on leadership development in the healthcare sector is justified. Our paper is the first to offer a rigorous investigation of whether leadership quality affects healthcare outcomes and whether autonomy or the organization and competition the organization faces plays a role.

Decision-makers in public healthcare settings must navigate in an environment influenced by complex social and political forces, persistent shortages of health professionals, requirements to use performance and safety indicators, and prevailing calls for transparency. Furthermore, managers and leaders in most publicly owned healthcare organizations are expected to do more with less, which has led to the need for leaders with more complex and multi-dimensional capabilities. Efforts to validate leadership theories in the healthcare sector have been limited to case studies of a small number of healthcare organizations (Wong and Cummings 2007; Fitzgerald et al. 2013), and have focused on more specific fields of healthcare (Verschueren, et al. 2013; Harris et al. 2014). While these field-specific case studies and evidence provide important insights into the effects of leaders on healthcare outcomes, there is a need for a more universal test of leadership theory within the sector. This paper is the first to test the leadership theory, as recommended by Behrendt et al. (2017), on various healthcare outcomes as our dependent variables, and provides a holistic picture of leadership effectiveness in the

healthcare sector. By consolidating data from various sources over five years for English acute hospital trusts[1], we provide a longitudinal test of leadership theory in the healthcare sector.

THEORETICAL BACKGROUND

Leadership essentially involves organising the human and technical resources needed to achieve organisations' goals. The main objective in leadership research has been to identify aspects of behaviour that explain leaders' impact on the performance of teams, work units and organizations. Throughout its history, the study of leadership has mostly been done using disparate leadership theories and models, with little desire to propose a unified model of leadership. Without such unification, tests of the theories lack parsimony and unveil only one piece of the puzzle. More recently, however, there has been a growing attempt to integrate leadership models synthesizing existing knowledge regarding leadership effectiveness (Fernandez et al. 2010; Yukl 2012; Behrendt et al. 2017). The validation of integrated leadership theories is still in its early days and especially lacking in its empirical application in the healthcare sector. Given the importance that policymakers have placed on the development of healthcare leadership in England and around the world (McAlearney and Butler 2008; West et al. 2014), this paper sheds light on the effects of leadership quality on healthcare outcomes.

Clinical participation on executive boards and in senior management positions has significant effects on hospital outcomes such as standardized death rates (Jiang et al. 2009, Veronesi et al. 2013), media-generated quality rankings in various medical specialities (Goodall 2011), and healthcare-commission rated service quality (Hammer et al. 2013; Veronesi et al. 2013). The number of clinicians on boards affects the hospital's financial performance (Molinari et al. 1993; 1995) and patient experience (Veronesi et al. 2015). Bloom et al.'s (2015) survey of hospital managers has shown that hospitals facing more competition have higher management quality scores. Their study provides suggestive evidence that management quality may be a mechanism through which higher hospital competition translates to better healthcare outcomes (Cooper et al. 2011). More recently, Mannion et

al. (2017) reported only very limited evidence that board-level management competencies matter for patient safety in NHS hospitals. Our study contributes to this line of research by providing a more direct link between leadership quality and healthcare outcomes.

We adopt the framework of effective leadership styles developed by Fernandez et al. (2010) and relatedly by Yukl (2012) to explore the effects of leadership on service quality in English hospitals. This is motivated by the identified 25 questions from NHS Staff Survey that relate to the ratings of management (senior and middle) and on how the (governing body of the) organisation deals with work-related situations. 21 of these questions best fit the three of Yukl (2012)'s four taxonomies of leadership styles: Task-oriented (clarifying, planning, monitoring operations, problem-solving), Relations-oriented (supporting, developing, recognizing, empowering) and Change-oriented (advocating change, envisioning change, encouraging innovation, facilitating collective learning). We do not use Yukl's (2012) External leadership style, as no question in NHS Staff survey corresponds to staff ratings of management's external networking, monitoring or representing the organisation externally. The remaining 4 questions can be best conceptualized by Fernandez et al. (2010)'s integrity-oriented leadership. Integrity and ethics are an important determinant of leadership quality in a public sector context such as the National Health Service (McCann and Holt 2009). More details on how each leadership style is classified and conceptualized are as follows.[2]

Task-oriented leadership

The main purpose of task-oriented leaders is to ensure that people, equipment, and other resources are used effectively to accomplish the mission of a group or organization. Specific component styles consist of planning, clarifying, and monitoring. By planning, managers give feedback to staff in terms of how they can improve to do their job (Kim 2002). By clarifying, managers can effectively identify and communicate the roles and objectives of the organisation and feedback to

the staff (Amabile 2004). By monitoring, managers keep a close eye on the staff's work and make sure they can provide effective feedback to the staff (Wang et al. 2011).

Relations-oriented leadership

Relations-oriented leadership involves reflecting concern for the welfare of subordinates and a desire to foster good interpersonal relations among organizational members. The relations-oriented leaders treat subordinates as equals, show concern for their well-being, appreciate and recognize their work, provide them with opportunities for personal growth, and involve them in the decision-making processes. The specific components of this leadership style consist of supporting, developing, recognizing and empowering. By supporting staff, relations-oriented behaviour fosters a harmonious and emotionally supportive work environment that contributes to higher levels of employee job satisfaction and motivation (Amabile et al. 2004). By developing staff, managers encourage staff to take on learning and development initiatives (Kim and Yukl 1995; Edmondson 2003). By recognizing, managers build relationships with staff and recognize the staff's potential and value to the organizations (Bradler et al. 2016). By empowering, managers work with staff as a team and involve them in important decisions (Huang et al. 2010) Relation-oriented leadership has been studied previously in the healthcare context but only in more specific fields of healthcare such as nursing: Wong and Cummings (2007) and Verschueren et al. (2013) find significant effects of nursing leadership on patient satisfaction, mortality rates, adverse events and complications.

Change-oriented leadership

Change-oriented leadership behaviours "increase innovation, collective learning, and adaptation to external changes." (Yukl 2012, p.72). When the change in the environment is gradual and there is no crisis, employees may not recognize the need for change. Leaders can provide information and consult on strategies on adopting the required change, and how similar work units are performing in other organizations. The components of this leadership style consist of advocating

change, encouraging innovation and collective learning. By advocating change, leaders can frame unfavourable outcomes in staff and patient feedback as an opportunity to learn and can propose a strategy to change involving staff (Kotter and Cohen 2002). By envisioning change, when errors happen, leaders can identify and communicate the extent of these errors and what should happen to fix these errors; these can be done either during appraisal meetings or after the changes have been adopted (Elenkov, Judge and Wright 2005). By encouraging innovation and facilitating collective learning, managers can encourage staff to suggest new ideas for improving services and taking action and communicating the changes to staff effectively (Elenkov et al. 2005; Wright and Pandey 2009). Change-oriented leadership has not been previously studied in the healthcare context. In a changing fiscal environment of recent years, change-oriented leadership may be the most effective leadership behaviour to bring about organizational success.

Integrity-oriented leadership

The integrity of standard virtues, honesty and selflessness in working hard to discourage and prevent unethical conduct and to maintain an environment safe for the disclosure of wrongdoing is another important leadership trait. Specific components of this leadership style consist of effectively dealing with sensitive situations, and promoting fairness and equality in the organization. Many researchers have emphasized the importance of fairness within organizations as a factor enhancing employee motivation (Janssen 2001; Brown et al. 2005; Kim 2005; Rubin 2009). A number of meta-analyses reveal that fair human resource practices and procedural justice within organizations determine employee's perceptions of job quality, organizations' mission and performance.(Colquitt et al. 2001, Wright et al. 2005). Orazi et al. (2013) find that integrity-oriented leadership is particularly effective in increasing employees' work effort in highly bureaucratic settings of federal and national offices. In public healthcare sector organizations, there is a strong demand for the legality, fairness,

and equitable treatment of staff and patients, and hence the value the followers put on leaders with integrity may even be stronger.

Integrating Leadership Styles into an Aggregate Measure

Burns (1978) is credited with suggesting there is a dichotomy in leadership between transformational and transactional leadership. Traditionally transactional leadership has been the leading theory to explain organizational outcomes. Recent examinations have revealed the increasing importance of other leadership styles commonly referred to as transformational leadership (Bass 1985; Ekvall and Arvonen 1991; Fernandez 2005; 2008; Palanski and Yammarino 2009). Nevertheless, whereas Burns saw these as distinct leadership styles, Bass (1985, 1997) suggested that the relationship between these styles and approaches is more complex and that different leadership styles are necessary for the success of organizations. Bass developed the full-range leadership model based on his belief that transformational and transactional leadership are not mutually exclusive to each other but are leadership patterns that all leaders possess and use depending on the contextual situation.

Our empirical approach evaluates the effects of leadership style on healthcare outcomes looking at the four disaggregated leadership styles (task-, relation-, change-, and integrity-oriented) separately but also evaluating an aggregated measure of leadership behaviours. We do this to recognize and acknowledge that the four leadership styles that we analyse are indeed interlinked and in many ways, it is artificial to separate those into distinct styles. Given Bass' (1997) conceptualization we agree that the leadership styles have to be analysed interconnectedly and should be aggregated on some level to measure "leadership quality" in general. One of the first papers trying to achieve this was Fernandez et al. (2010) who term the aggregated leadership styles concept as "integrated leadership." Our empirical procedure follows suit and uses a similar procedure of aggregating leadership styles into one measure. We discuss more our measures in Section 4 of the paper after we talk about the healthcare sector in focus.

There have been very few empirical tests on the effects of leadership quality on outcomes within the NHS despite the popularity of leadership development programs. The NHS managers – their numbers, rates of pay and overall costs – are often the subject of contentious debate in the media and among politicians and policy-makers. Some commentators suggest that the NHS is bureaucratic and over-managed, and that much of NHS management is unnecessary (Walshe and Smith 2011). Researchers at the King's Fund,[3] however, have disagreed with these views and have argued that collective leadership within the NHS could achieve significant service improvements and transform the way health care is provided (West et al. 2014). Meanwhile, the scientific literature only acknowledges the importance of effective nursing leadership on patient outcomes. The review studies by Wong and Cummings (2007) and Verschueren et al. (2013) focus on the effects of nursing leadership on patient satisfaction, mortality rates, adverse events and complications. The association is the strongest for the adverse events and complications especially for the leadership behaviours that were transformational and relation-oriented. Furthermore, Harris et al.'s (2014) recent study of historical role-models and nurse leaders show that transformational leaders create an environment open to innovation and communication that enhances healthcare quality. Given the theoretical importance of leadership quality on organizational success, we will test the effect of the reviewed leadership styles on healthcare quality in the English NHS. Our first hypothesis is as follows:

Hypothesis 1: *Leadership quality as measured by task-, relation-, integrity-, and change-oriented leadership styles captured by the integrated-leadership measure will significantly predict healthcare quality as measured by staff-, patient-rated satisfaction and clinical quality.*

THE HEALTHCARE SECTOR IN FOCUS

Potentially important structural changes in public administration have taken place in recent years around the world. New Public Management reforms have led to the restructuring of (vertically integrated) public organisations to create semi-autonomous organizations with their own (corporate style) boards (Pollitt and Bouckaert 2011). In the health sector, Saltman et al. (2011) discuss how the

emergence of public hospitals in some European countries have been reformed as public owned enterprises with greater financial and institutional autonomy. In the UK, the reform resulted in the introduction of foundation trust hospitals and private–sector healthcare providers following the Health and Social Care Act (2003). This status granted financial and executive autonomy to public hospitals and introduced competition with private sector providers. The policy aimed to reduce costs and waiting times and promote innovation and responsiveness to patients throughout the healthcare system (Allen 2009; Cooper et al. 2016).

Cannela and Monroe's (1997) strategic leadership theory proposes that managers should have sufficient discretion to affect organizational outcomes. The reforms in England have unquestionably increased autonomy and competition in the healthcare sector, which created a context in which healthcare leaders have high levels of discretion to influence outcomes (Veronesi and Keasey 2012; Wright et al. 2012). Such autonomy and competitive pressure on UK public hospitals allow organizational policymakers to make more careful staff recruitment and staff progression decisions with an emphasis on developing strong leaders who can make a difference for service quality and outcomes. Leaders in the current system may feel more responsible for their followers and strive to achieve higher results (Wang and Cheng 2010; Ng et al. 2008). Beyond this, healthcare leaders in England are more responsive to the increasing amount of publicly available information on hospital outcomes and patients' freedom of choice and ability to implement clinically-led changes aimed at improving services.

On the other hand, there is research that suggests that regardless of the enhanced autonomy and competition, hospital managers still find themselves exposed to the web of accountability which encourages overly risk-averse behaviour and discourages innovation (Allen et al. 2012). The adoption of aggressive target policy by the English NHS coupled with the publication of hospital outcome indicators, such as mortality rates, waiting times and patient experience resulted in strong sanctions for poor performing hospital managers. The sanctions are the dismissal of senior hospital managers

for substandard performance against the targets, and the rewards consist of granting of greater autonomy for those who perform well. This policy has been termed as "target and terror" by Propper et al.'s (2008) and findings suggest a positive effects of this policy on patients' waiting times to receive treatment in a hospital (Kelman and Friedman 2009). While there is an increasing number of studies suggesting that effective management and leadership quality in hospitals have a positive effect on performance outcomes (Bloom et al. 2015), the extent to which and whether this effect is due to various leadership styles, managerial autonomy and competition remain unclear. We thus test the following hypotheses.

Hypothesis 2: *The organizational autonomy of a hospital will moderate the effect of leadership quality on healthcare service quality.*

Hypothesis 3: *The level of competition a hospital faces will moderate the effect of leadership quality on the healthcare service quality.*

DATA AND METHODOLOGY

To study the effect of leadership quality on healthcare outcomes we focus particularly on the NHS hospital sector in England. In 2015, 1 780 000 people were employed by NHS England with a budget of around £107 billion a year in funds. Nearly half (47%) of the NHS budget was spent on acute and emergency care (NHS England 2014). During the 2000s, there has been a large growth in publicly available data in the healthcare sector, though the available data tend to be at a reasonably aggregate level (e.g., at hospital group—known as hospital trusts in the UK). We use the publicly available data provided by the Health and Social Care Information Centre (HSCIC) for performance indicators and control variables and compile our unique dataset to measure leadership quality from NHS staff surveys.[4]

Our data consists of 152 English acute specialist and non-specialist NHS hospital trusts within 5 years of 2010-2014 which continuously participated in the annual NHS Staff Survey. Due to the

process of data compilation from different sources, the merged dataset covers a sample of 118 trusts. This leaves us with an unbalanced panel of 591 observations with a minimum of 4 years of observations per hospital. The sample is adequately representative of the whole acute hospital trust population in terms of performance indicators, leadership quality and other observable characteristics. Table 1 summarizes all of our variables and presents descriptive statistics for each variable and correlation coefficient matrices.

<<<Insert Table 1 about here>>>>

Dependent Variables

The sustained policy pressure to improve the quality and consistency of healthcare through structural changes such as granting more organizational autonomy to providers (CMND 7615, 1979; Griffith's Report, 1983; Department of Health, 2001), by setting performance standards and targets and increasing competition across providers (Department of Health 2002, 2005). As a result of this, hospitals are monitored by Clinical Commissioning Groups (CCG) and a large number of outcome measures are reported and published. Service quality in hospitals is difficult to measure, so regulators and researchers typically use a wide range of performance indicators. Propper and Wilson (2003) report more than 35 performance outcomes of healthcare in the UK which see thorough scrutiny both by members of the public and government monitoring agencies. We use several performance indicators from three different sources that we believe present a good mix of measures from various perspectives as our dependent variables: a more subjective staff-rated and patient-rated hospital quality, and a more objective clinical quality. This allows us to present a more thorough test of leadership theory in the healthcare context.

Staff-rated quality. We use two questions from the NHS Staff Survey as a measure of staff rated hospital quality both in terms of a place to work and place to receive treatment. "As staff are so critical to the success of contemporary organizations, their satisfaction is both a vital quality measure

for an organization, as well as an end result in itself" (Trottier et al. 2008, p.322). The percentage of staff agreeing or strongly agreeing to the statement "I recommend my organization as a good place to work" (*RecWork*) and "If a friend or relative needed treatment, I would be happy with the standard of care provided by my organisation" (*RecTreatm*) are the measures of hospital quality from the staff perspective. On average, around 64% of staff recommend their hospital as a place to work ranging from 20.2% to 79.2% (with a standard deviation of 10.1). Similarly, on average around 59.2% of staff recommend their hospital as a place to receive treatment ranging from 33.2% to 89.5% (with a standard deviation of 9.5). While the staff rated hospital quality measure has been used by researchers to inform policy-makers (West and Dawson for King's Fund 2012), as far as we know, we are the first study in the scientific literature to use these measures as hospital quality indicators.

Patient-rated quality. In each acute NHS hospital trust, 850 patients are surveyed annually. These include a random sample of all adult inpatients and exclude maternity patients and patients who had a termination of pregnancy. During the years of 2010-2014, the survey response rates range from the lowest of 47% in 2014 to the highest of 53% in 2011 (Care Quality Commission 2015). CQC have divided the 20 questions (presented in Table A1 of the Appendix), to five domains of Access and Waiting (*Access*), Safe, High-Quality, Coordinated-Care (*Coordination*), Better Information, More Choice (*Information*), Building Closer Relationships (*Relationships*) and Clean, Friendly, Comfortable Place to be (*Comfort*) with an *Overall* score summarizing all the above into one. The *Overall* scores are relatively high ranging from 67.1 to 82.7 (with a standard deviation of 2.51) as in most other studies analysing the patient experience. However, this upward scaling of patient-rated hospital service quality is not believed to affect the validity of the responses (Thi et al. 2002; Pérotin et al. 2013).[5] Data on patient experience have not always been found to systematically relate to key aspects of hospital quality (Leonard, 2008). However, this type of measure is suitable as one alternative performance indicator to assess aspects of service quality that are observed by patients.

***Clinical quality*:** The clinical outcome we use is the age-standardized hospital mortality rates within 30 days of emergency surgery (*Non-ElectiveDeath*). Some deaths following non-elective surgery may be potentially preventable through better emergency access to surgeons, theatres and diagnostics, and better identification and care of high-risk patients before and after surgery. The NHS may be helped to prevent some of these deaths by seeing comparative figures and learning lessons from follow-up investigations (Clinical Indicators Team 2016). We choose this measure because both the US and UK regulators use death rates as part of a broader set of measures of hospital quality (Kessler and McClellan 2002; Bloom et al. 2015). Using emergency surgeries helps to reduce selection bias because elective cases may be non-randomly distributed across hospitals. Also, death rates are well recorded annual measures that cannot be easily "gamed" by administrators trying to hit government targets (as opposed to, for example, waiting times or infection rates). In our data, the average death rate is 3667 deaths per 100 000 inpatient spells for non-elective procedures ranging from 1857 to 6449 (with a standard deviation of 717.6) across hospital trusts and years.

Independent Variables

We use four leadership styles and integrated leadership quality as our main independent variables (Yukl 2012; Fernandez et al. 2010). We construct a measure of four leadership styles using answers to the questions in the NHS Staff Survey in the years of 2010, 2011, 2012, 2013 and 2014 which provides us with a panel dataset. The dataset was downloaded from the NHS Staff Survey website (www.nhsstaffsurveys.com), where the data is presented in the anonymized aggregated hospital trust level. The 25 identified questions asked staff to report on the behaviour of and attitudes towards superiors at multiple levels of organizational hierarchy, including low-level supervisors and team leaders, managers and senior executives. These survey items represent organizational members' perceptions of leadership distributed across their organizations without reference to a solo or focused leader (Gronn, 2002; Fernandez et al. 2010). The groupings of questions into components of each leadership style are presented in Table 2 and are aimed at mirroring Yukl's (2012) change-, task-,

relations-oriented and Fernandez et al. (2010)'s integrity-oriented styles. We create an index for each leadership style by constructing standardized summated rating scales for each category. The integrity-oriented leadership has the highest average score (mean 0.72, std.dev 0.033) followed by relations-oriented (mean 0.64, std.dev 0.046), change-oriented (mean 0.59, std.dev 0.055) and task-oriented (mean 0.55 std.dev 0.045) leadership style. Panel B of Table 1 presents the summary statistics and the correlation coefficients between the variables.[6]

The leadership styles questions suggested should be relatively reliable to measure the same leadership style by having internal consistency or being at least associated. We use association-based Cronbach's alpha to test the reliability of our measures, where an alpha value above 0.70 is preferred. The Cronbach's alphas for the four leadership style groupings are 0.82 (relations-oriented leadership), 0.77 (task-oriented leadership), 0.78 (integrity-oriented leadership) and 0.84 (change-oriented leadership). We also assessed the construct validity. The survey items selected for each of the categories exhibit face validity and appear to be measuring the leadership styles described by Yukl (2012) and Fernandez et al. (2010). The four categories and the items contained in them also seem to capture many, if not all, of the facets of the four leadership style definitions of Yukl (2012) and Fernandez et al. (2010) and Yukl (2012), thus providing good evidence of content validity. Table 2 explicitly presents how each question fits one or more components of the Yukl's (2012) leadership styles.

Next, we aggregate the four leadership styles into one variable by creating an integrated leadership variable by exploratory factor analysis. The four measures of leadership styles load to the integrated leadership measure with loadings ranging from 0.72 (integrity-oriented) to 0.88 (relations-oriented). With an eigenvalue of 2.72, the four leadership styles explain 96% of the variation in the integrated leadership factor. Together with the four leadership styles, we use integrated leadership as another independent variable of interest to predict the dependent variables of hospital service quality.

<<<Insert Table 2 about here>>>>

Control Variables

Following a standard approach in the NHS acute care sector research (Pérotin et al. 2013; Veronesi et al. 2013, Bloom et al. 2015), we control for variables related to patient case-mix of age profile (*MeanAge*), rate of emergency admissions (*EmergRate*), level of hospital trust activity such as daytime to night-time episode rate and occupancy (*DayEpsRate*; *OccupRate*), and financial investment to improve hospital facilities (*CapitalInv*). We also include factors such as caseload, measured as the number of admissions divided by the total staff number (*CaseLoad*), mean waiting times for admission (*MeanWait*) and the severity of cases treated using the length of stay in the hospital for each patient as a proxy (*MedianLOS*). Taken together, these controls help to distinguish between hospitals, given the available resources and particular patient populations and how these, in turn, may affect the dependent variables. Lastly, to control for the possible impact of organizational and contextual factors, we take into account the size of trusts as measured by the number of beds (*TotalBeds*). This is in line with the line of research which suggests that patient experience tends to be worse in larger organizations (Sjetne et al. 2007). In addition to the observable characteristics, we control for any unobservable time-invariant characteristics of hospitals (such as culture, age of facilities, resources and patient characteristics) by the statistical strategy we employ.

Moderator Variables

Given the recent public reforms in the English healthcare sector to increase the autonomy of and competition among hospitals, it is of interest to test whether the effect of leadership quality on healthcare service quality is moderated by autonomy and competition. As noted earlier, since 2003 a growing number of trusts have been reconfigured through a process of authorization into a more independent organizational form concerning the management of resources and strategic orientation (Veronesti et al. 2015). These hospitals have been granted a Foundation Trust (FT) status. Currently,

there are 84 foundation trusts out of a total of 135 acute non-specialist trusts and 17 foundation trusts out of a total of 18 acute specialist trusts.[7] As such, the foundation trust status dummy variable (*FT*) serves as a useful proxy for assessing the level of organizational autonomy and greater flexibility in strategic and operational matters (Veronesi et al. 2015). We create an interaction term between the dummy variable and the leadership quality to test *Hypothesis 2* as to whether the interaction term has a significant coefficient; given that we are interested in the significance of the interaction term coefficient and not the FT status coefficient the potential endogeneity between service quality and FT status is of lesser importance.

Similarly to Propper et al. (2004) and Bloom et al. (2015), we define a hospital's catchment area as a 15km radius, a commonly used definition in England. The hospitals less than 30km away can be considered as competitors as their catchment areas will overlap. We thus define the competition (*Compet*) measure as the number of other hospitals within a 30km radius. The variable takes the values from 0 to 26 with a mean (std. dev) of 7 (7.12) hospitals in the 30km catchment area. As an ordinal variable, we create an interaction term with leadership quality. We test *Hypothesis 3* by testing whether the interaction term has a significant coefficient.

Empirical Strategy

We test for Hypothesis 1 and assess the predictive power of leadership quality on hospital quality by estimating the following model at hospital level:

$$HospQuality_{it} = \alpha_1 + \beta_1 LeadQuality_{it} + \gamma_1 Z_{it} + u_{1i} + \epsilon_{1it} \qquad \textit{[Equation 1.]}$$

Where $HospQuality$ represents the nine dependent variables of staff- and patient-rated hospital quality and death rates form non-elective procedures, $LeadQuality$ represents the four leadership styles and the integrated leadership variable. Z_{it} is a set of hospital-level control variables in hospital i, year t; α_1, β_1 and γ_1 are coefficients to be estimated, u_{1i} represents the hospital-specific

intercept (fixed effect) allowing for unobserved heterogeneity, and ϵ_{it} is the idiosyncratic error, where $u_{1i} + \epsilon_{it}$ represents the composite error.

Random effects (RE) or fixed effect (FE) models control for unobserved effects in panel data models by removing unobserved effects through differencing or demeaning. RE and FE models are asymptotically equivalent in terms of efficiency, but inconsistent even with large T when variables are endogenous. To deal with this issue, we conduct a Hausman test to determine which model is preferred. The Hausman tests the null hypothesis that the coefficients estimated by the efficient RE estimator are equal to those from the consistent FE estimator. According to our results, the RE model is rejected and therefore we omit all time-invariant hospital-level controls and estimate our models using the FE estimator with robust standard errors.[8]

To test for Hypotheses 2 and 3, we conduct a moderation analysis by using interaction terms and estimate the following equation. Given that *FT* status and *Comp* variables are time-invariant, we use a RE model for simplicity.[9]

$$HospQuality_{it} = \alpha_2 + \beta_2 LeadQual_{it} + +\psi_1 FT_i + \mu_1 Comp_i + +\psi_{2i} LeadQual_{it} \times FT_i +$$

$$+\mu_{2i} LeadQual_{it} \times Comp_i + \gamma_2 Z_{it} + u_{2i} + \epsilon_{2it} \qquad \textit{[Equation 2]}$$

To ease the interpretation of the independent variables on the dependent variables we standardize all variables for our estimation. This also allows us to use linear regression models where our dependent variables are no longer in percentages or proportions. We can thus make inferences about the coefficients in terms of how the dependent variable changes as a result of a one standard deviation change in the independent variable.

As the correlation coefficients among our four leadership styles are above 0.50 (see Table 1), to avoid multicollinearity we estimate the effect of each leadership style on hospital quality

individually. We also estimate the model with our constructed integrated leadership variable as our dependent variable separately.

RESULTS

Table 3 reports the coefficients from the fixed effect panel regressions estimating the effect of leadership quality on hospital quality. Each cell of the table corresponds to an individual regression with one independent variable, one leadership behaviour as a dependent variable and a set of controls. The regression analysis showing the effect of controls on our dependent variables are reported in the Appendix of the paper and the robustness analysis using different sets of controls are available upon request.

In the first two columns of Table 3, our dependent variable is the staff rated hospital quality. We find that the integrated leadership score and all of the four leadership styles have positively signed coefficients and are statistically significant in predicting staff recommendation to work and receive treatment in a given hospital. Furthermore, given the magnitude of the coefficients, we can note that task-oriented leadership has the largest influence on the recommendation to receive treatment and the recommendation to work in a hospital: one standard deviation increase in task-oriented leadership score improves staff rating of a hospital as a good place to receive treatment by 0.428 and as a good place to work by 0.669 standard deviations. The relations-oriented leadership, on the other hand, has the smallest influence: one standard deviation increase in relations-oriented leadership quality improves staff rating of a hospital as a good place to receive treatment by 0.176 and as a good place to work by 0.431 standard deviations.

Result 1a: *Leadership quality significantly and positively affects staff-rated hospital quality: task-oriented leadership style has the highest effect, while the relation-oriented leadership style has the lowest effect on the staff-rated hospital quality.*

Overall, we find that the coefficients of leadership styles on staff-rated quality are higher than the coefficients from patient-rated and clinical hospital quality. These coefficients, however, may be prone to some confounds such as common source bias (Jakobsen and Jensen 2015; Dionne et al. 2002; Meier and O'Toole Jr. 2012). The bias manifests itself with an endogenous relationship between the independent and dependent variables that are inherent to how the data is collected. In our case, the staff who rates their leaders also rate the hospital being a good place to work and receive treatment. It is thus very likely that staff ratings of leaders may be affected by their disposition towards their hospitals or vice versa. This observation, however, does not preclude the possibility that part of the reported coefficients indeed captures the staff's view of how hospital leaders shape their organization.

Secondly, we focus on hospital quality rating coming from a different data source. The results using the patient satisfaction scores as the dependent variable are reported in columns 3 to 8 of Table 3. We find that leadership quality has a positive and significant effect on the overall patient satisfaction score and four out of the five patient satisfaction categories, including Coordination, Information, Relationships and Comfort. The change-oriented leadership quality has the highest impact on the above-mentioned domains: e.g. one standard deviation increase in change-oriented leadership increasing overall patient satisfaction score by 0.249 standard deviations. For the Access (waiting times and admission) category, we find only limited statistical significance, with relations- and integrity-oriented leadership predicting patient satisfaction with access to the hospital at the 10% significance level. This is not surprising since the Access category includes components of patient satisfaction regarding hospital quality that may be out of hospital leaders' control, such as the waiting times and emergencies which result in admission dates being changed. In the Appendix, we also present results using two factors summarizing patient satisfaction scores as dependent variables (Table A2). We find consistent results that leadership quality is a positive and significant predictor for both factors of patient satisfaction.

Result 1b: *Leadership quality significantly and positively affects patient-rated hospital quality: change-oriented leadership style has the highest effect on the patient-rated hospital quality. Leadership quality does not affect the Access category of patient-satisfaction.*

Lastly, in column 9 of Table 3, we test whether leadership quality has an impact on a clinical measure of hospital quality, namely age-standardized death rates from non-elective procedures. We find that integrated leadership and all individual leadership styles except integrity-oriented leadership have a negative and significant impact on death rates at the 1% significance levels. In terms of magnitude change-oriented leadership style has the highest effect on death-rates: one standard deviation increase in change-oriented leadership quality decreases the death rate by 0.213 standard deviations. In terms of nominal effects, this means that 5.1% points increase in change-oriented leadership score[10] will result in 0.213×717.6=152.8 fewer deaths per 100.000 cases of non-elective procedures. The integrity-oriented leadership has the lowest effect on death rates from non-elective procedures and yet we observe that 3.3% points increase in the integrity-oriented leadership score will result in 0.08×717.6=57.4 fewer deaths per 100.000 cases.

Result 1c: *Leadership quality significantly and positively affects a hospital's clinical quality: change-oriented leadership style has the highest effect while integrity-oriented leadership style has the lowest effect on death rates from non-elective procedures.*

In the Appendix, we report the effect of controls on our dependent variables (Table A3). We find that the rate of emergency admissions and the mean age of the patient population predict staff recommendation of their hospital as a place to receive treatment. Hospitals with higher levels of activity as measured by the rates of emergency admissions and occupancy rates receive higher ratings from staff as places to work. However, staff rate hospitals as places to work more negatively when the caseload on staff is higher. As expected, we find that trust size, caseload and percentage of bed occupancy have a negative impact on patient experience especially on the ratings of access (Veronesi

et al. 2015). At the same time, consistent with previous studies, we find that hospitals with older patient populations receive higher patient satisfaction scores especially in the domain of building closer relationships (Perotin et al. 2013; Veronesi et al. 2015). Lastly, we find a highly significant effect of severity of cases a hospital faces, as measured by the median length of stay, and caseload on death rates: a one standard deviation increase in the severity of cases and caseload, increases death rates by 0.15 and 0.27 standard deviations, respectively.

<<<Insert Table 3 about here>>>>

Moderator analysis of autonomy and competition

Is leadership quality more effective in predicting healthcare quality in hospitals that are more autonomous and face higher competition? To answer this question we run regressions with interaction terms. The results are reported in Table 4.

To test for Hypothesis 2, we look at the sign and the significance levels of the coefficients for the interaction terms between the leadership styles and the FT status of the hospital. We find limited support that the hospital autonomy moderates the leadership effects on hospital quality. The only significant positive result is the moderation effect of FT status on the Relationships subdomain of patient-rated healthcare quality: 1 standard deviation increase in relation-oriented leadership increases the patient satisfaction in the Relationships domain by 0.151 standard deviations in non-FT hospitals and by 0.151+0.073=0.224 standard deviations in FT hospitals, which is statistically significant at 5% level. A similar result holds for change-oriented leadership style as well, but this is only significant at the 10% level. Overall, 1 standard deviation increase in integrated leadership increases the patient satisfaction in the Relationship domain by 0.123 in the non-FT hospitals and by 0.123+0.093=0.216 standard deviations in FT hospitals. We do not find any moderation effect of foundation status on leadership effects for other measures of healthcare quality.

Result 2: *We find limited support for the moderator effect of hospital autonomy on the leadership effects on healthcare quality: only in the Relationships domain of the patient satisfaction scores, better leadership in more autonomous hospitals results in better patient-rated healthcare quality.*

To test for Hypothesis 3, we look at the sign and the significance levels of the coefficients for the interaction terms between the leadership styles and the intensity of the competition a hospital faces. We find a moderator effect of leadership quality on healthcare quality by competition similar to the autonomy. The moderation effect is existent only for the patient-rated healthcare quality. The leadership quality has a stronger effect on the Relationships domain of the patient satisfaction scores in more competitive hospitals for relations-, integrity- and change-oriented leadership styles and the Information domain for the relations-oriented leadership style. There is also some evidence that the effect of change-oriented leadership style on non-elective death rate is moderated by competition: the coefficient of -0.152 for the interaction terms is, however, significant at only 10% significance level.

Result 3: *We find limited evidence that the effect of leadership quality on healthcare quality is moderated by competition a hospital faces: the moderator effect is significant in the Relationships and Information domains of patient satisfaction scores and death rates from non-elective surgeries.*

<<<Insert Table 4 about here>>>>

ROBUSTNESS ANALYSIS

To test the robustness of our results, we used various combinations of explanatory and control variables and a series of additional estimation techniques - feasible generalized least squares (FGLS) and Arellano-Bover/Blundell-Bond estimation. FGLS estimation assumes a heteroskedastic error structure with no cross-sectional correlation of the error variance-covariance matrix. To account for the possibility that hospital quality and leadership quality may be reversely causal to each other, we use Arellano–Bover/Blundell–Bond dynamic estimation to treat leadership quality as endogenous, the

concern is not necessarily that leadership quality may drive hospital quality improvement but that good leaders are recruited to the hospital trusts that are already successful.

The results reported in Tables A4 and A5 of the Appendix and are highly consistent with those reported in Table 3. We note that in the Arellano-Bond estimations integrated leadership loses its significance for hospital death rates, however, we still observe a significant negative effect of change-oriented leadership on death rates at the 5% level. As noted earlier, this emphasises the importance of transformational leadership practices on organizational outcomes highlighted in previous studies (Dvir et al. 2002; Judge and Piccolo, 2004; Wright and Pandey, 2009).

To additionally address the issue of endogeneity we use a two-stage least squares regression for panel data using the lag of the independent variables as instruments. The explanatory variables denoted here as *Z* include: age profile (*MeanAge*), rate of emergency admissions (*EmergRate*), levels of hospital trust activity (*DayEpsRate*; *OccupRate)*, financial investment to improve hospital facilities (*CapitalInv*), caseload measured as the number of admissions divided by the total staff number (*CaseLoad*), mean waiting times for admission (*MeanWait*) and the severity of cases treated using the length of stay in the hospital for each patient as a proxy (*MedianLOS*).

$$LeadershipQuality_{it} = \alpha_4 + \beta_4 LeadershipQuality_{it-1} + \gamma_4 Z_{it} + u_{4i} + \epsilon_{4it}$$

[Equation 3.]

The results of the first stage regressions are reported in Table A6 of the Appendix with the F-statistics showing significant model identification in the first stage. In the second stage regressions, the predicted value of leadership quality obtained from the first stage is now used as an independent variable to explain hospital quality, as measured by staff and patient survey scores and hospital death rate.

$$HospitalQuality_{it} = \alpha_5 + \beta_5 \widehat{LeadershipQuality}_{it} + \gamma_5 Z_{3it} + u_{5i} + \epsilon_{5it}$$

[Equation 4.]

This further analysis, which provided comparable results, supports our main finding that leadership quality positively influences hospital service quality as rated by staff, patients and clinical measurements. Consistent with the previous results task- and change-oriented leadership behaviours have the most significant effects in all domains of healthcare outcomes. We find a very limited effect of leadership quality with a marginally significant effect of integrated leadership behaviours on the Access scores of patient satisfaction. We also observe the slightly weaker effect of leadership on clinical outcomes with non-significant effects of relations- and integrity-oriented leadership styles on hospital death rates.

As a further robustness check for the conceptualization of our leadership measures, we look at the correlations between leadership quality measures and the number of hospital managers being promoted and dismissed in a hospital. We standardize the number of dismissed and promoted managers in a hospital in a given year by the hospital's size (number of staff). Table A7 of the Appendix reports the regression results on the association between the lag of our leadership quality measures and managerial promotion and dismissals. Integrated leadership scores significantly predict the managerial promotion and dismissal rates with 1 standard deviation increase in integrated leadership score increasing promotions by 0.25 standard deviations and decreasing dismissals by 0.26 standard deviations. Confirming the previous results on the specific leadership styles, two leadership styles stand out: change-oriented leadership has the highest impact on promotion rates while task-oriented leadership has the highest impact on dismissal rates.

CONCLUDING DISCUSSION

Given the extended period of fiscal austerity, the public sector faces continued pressure to control costs and reduce expenditure. Whilst the NHS budget has been ring-fenced, that is guaranteed that funds allocated for a particular purpose will not be spent on anything else, the NHS is still required to fill a funding gap of between £22-66 billion by 2020. In light of this, healthcare leaders carry a heavy burden of organizational performance and are instrumental in the delivery of high quality, yet

cost-effective efficient healthcare services. The effectiveness of leadership in NHS is thus an important and salient policy question that also holds wider relevance to the rest of the public sector leadership development. Given that the funding to NHS is not likely to increase in the near future, the importance of NHS Leadership Academy development programs should be tested empirically. Our paper thus conducts such a long-overdue test. Our results indicate that controlling for all other characteristics of hospitals (including capital investment, caseload, occupancy rates etc.), developing high-quality leadership can improve patient and staff satisfaction and clinical quality. In this sense, policymakers can use development of leadership quality to improve health service quality as an alternative strategy for increasing funding.

Despite an enormous amount of discussion about public sector leaders and, more specifically, healthcare leaders, there has been relatively little broad-scale empirical analysis on the subject (van Wart 2013). Does leadership quality matter for healthcare outcomes? Yes, it does. For almost all domains we find a significant positive effect of leadership quality on hospital service quality. Specifically, our results emphasise the importance of the change-oriented leadership style in terms of advocating change, articulating an inspiring vision, encouraging innovation and collective learning. On the other hand, we find that task-oriented leadership style in terms of planning, clarifying, and monitoring tasks are more effective for staff-rated quality measures, namely, recommending the hospital as a place to work and receive treatment. We also find that increased organizational autonomy and competition may have some but limited moderating effects on patient-rated healthcare quality. From the data reported in this article, it is not possible to explain precisely why this is happening. One possibility is that the governing boards and directors of more autonomous and more competitive hospitals are more motivated to make selective choices of leaders in organizations who focus on more patient-centric healthcare service. Indeed, it may be that FTs and more competitive hospitals, through the higher representation of clinicians on governing boards (Veronesi et al. 2015), have moved closer

to a “developmental culture” characterized by a greater concern for innovation and advancement and clinical teams being given more freedoms and responsibilities.

Our results have important implications for policymakers highlighting the importance of strong leadership development programs and, more specifically, focusing on particular leadership styles which, as our results suggest, have a significant impact on healthcare quality. More importantly, our analysis of leadership across organizational hierarchies, from team leaders to senior managers, suggests that leadership development matters at all levels. Our study points to the support and development of change-oriented leadership styles (such as advocating change, articulating an inspiring vision, encouraging innovation and collective learning), and task-oriented leadership styles in particular (such as planning, clarifying, and monitoring) as they seem to have the greatest impact on hospital outcomes. More specifically, leaders who focus on finding and fixing errors and acting on staff and patient feedback help to reduce death rates due to surgery. This shows a relationship between leadership behaviours and an objective and a very serious outcome. Notwithstanding, an ideal healthcare leader should encompass all effective leadership styles in an integrated way: leading with the integrity and ethics of an integrity-oriented leader, with the flexibility and responsiveness of a change-oriented leader, with a precision and focus of a task-oriented leader, and with the emotional touch of a relations-oriented leader. Indeed, in practice, we are starting to see the rise of leadership development programs in the healthcare sector, such as the NHS Leadership Academy (established in 2014) whose training models are based on integrating various effective leadership styles.

It is worth acknowledging that in some situations training and developing all four leadership styles may be impossible or impractical in terms of cost and time required to develop and synthesize integrated leadership programs. In these situations, our results suggest that focusing on task-oriented (such as the ability to plan, clarify and monitor people, equipment and other resources in hospitals) and change-oriented (advocating change, articulating an inspiring vision, encouraging innovation and collective learning) styles will bring the most cost-effective efficient results.

While our findings provide strong evidence for a link between leadership quality and healthcare outcomes, a couple of caveats need to be noted. Firstly, although most researchers agree that the task, relations, change and integrity elements are distinguished, not all agree on the conceptual clarity of the specific elements that define each (Lowe et al. 1996; Trottier et al. 2008). The leadership styles that we analyse are adopted from previous literature but they are not exhaustive. The leadership model lacks some of the styles associated with leadership, such as external styles of being a figurehead, liaison, spokesperson, entrepreneur and negotiator (Javidan and Waldman 2003; Fernandez et al. 2010). It is also worth noting that our study focuses on the measurement of leadership quality as perceived by followers (hospital staff), and not as observed by third parties. Thus, further research could incorporate a more exhaustive list of leadership styles and differentiate between perceived and observed measures of leadership quality in healthcare organizations.

Secondly, measuring the dependent and independent variables based on different data sources we ensure our results do not suffer from common source bias. However, a thorny methodological issue that may arise in this study is simultaneity bias. Attribution theory of leadership posits that followers make positive attributions of leaders for a variety of reasons, including when the organization performs well (Awamleh and Gardner, 1999; Lord and Maher, 1991). In our panel data framework, we partially control for this issue by evaluating the changes in the dependent variables on the independent variables. Using the lag of leadership quality as an instrument and estimating a two-stage model significantly reduces the simultaneity bias and provides consistent results; however, we cannot completely exclude it. We invite further research on this using randomized control trials and field experiments to test for leadership theories within the healthcare sector. It is unfortunate that up to now it has been extremely difficult to conduct field experiments within public sector domains and experimental studies are limited to a very few (Dvir et al. 2002; Bellé 2013; D'Adda 2011; Antonakis et al. 2014).

NOTES:

1 An NHS trust is an organisational unit within the English National Health Service, generally serving either a geographical area or a specialised function (such as an ambulance service). In any particular location there may be several trusts involved in the different aspects of healthcare for a resident. The trusts are not trusts in the legal sense but are in effect public sector corporations. Each trust is headed by a board consisting of executive and non-executive directors, and is chaired by a non-executive director.

2 Differently from Fernandez et al. (2010), we exclude diversity–oriented leadership because of the limited availability of the NHS Staff Survey data measuring diversity-oriented leadership behaviours in the years 2010-2015.

3 The King's Fund is an independent think tank in England, which is involved with work relating to the health system in England. It organises conferences and other events.

4 HSCIC is tasked with the responsibility for collecting, analysing and presenting health and social care data. All of our data is acquired in aggregated hospital trust level from this source.

5 We additionally use factor analysis to group patient satisfaction scores into two categories. For this alternative analysis of the patient satisfaction scores with factor analysis please see Appendix A of the paper.

6 Alternatively, we could have used factor or principal component analysis to reduce the questions per each grouping into one factor or component. However, doing so would result in losing some data for two questions defining change-oriented leadership role which did not exist in some years of the NHS Staff Survey (see Table 2). We have, however, conducted such analyses and the results are identical to the ones reported in this paper.

7 NHS Statistics, fact and figures. http://www.nhsconfed.org/resources/key-statistics-on-the-nhs (accessed 07/09/2017)

8 The results from pooled OLS, RE and hybrid model (Schunk 2013) panel regressions show similar results both qualitatively and quantitatively to the ones reported in the next section and are available upon request.

9 In a set of unreported regressions we also estimate pooled OLS and a hybrid model which produce quantitatively and qualitatively similar results to the ones reported in this section.

10 That is, 5.1% points more staff agreeing or strongly agreeing to a statement being true in NHS staff survey questions

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Table 1: Descriptive statistics of the variables and correlation coefficients

A Dependent Variables:	**Mean**	**Std. Dev**	**Obs**	**1.**	**2.**	3.	4.	5.	6.	7.	8.
1. Staff Rated RecWork	56.1	9.5	591								
2. Staff Rated RecTreatm	63.9	10.1	591	0.85							
3. Patient Satisfaction Overall	75.6	2.51	590	0.34	0.51						
4. Patient Satisfaction Access	83.6	2.97	590	0.23	0.38	0.79					
5.Patient Satisfaction Coordination	64.5	3.53	590	0.24	0.38	0.89	0.59				
6. Patient Satisfaction Information	67.1	3.31	590	0.43	0.57	0.88	0.59	0.73			
7. Patient Satisfaction Relationships	83.5	2.62	590	0.23	0.39	0.88	0.62	0.75	0.70		
8. Patient Satisfaction Comfort	79.2	2.21	590	0.32	0.47	0.84	0.59	0.68	0.68	0.73	
9. Non-Elective Death Rate (age stand. per 100,000 emergency admissions)	3667.4	717.6	587	-0.06	-0.05	-0.13	-0.15	-0.11	-0.08	-0.18	-0.03
B Independent Variables:	**Mean**	**Std.Dev**	**Obs**		**10.**	**11.**	**12.**				
10. Relations-Oriented Leader Score	64.2	4.6	591								
11. Integrity-Oriented Leadership Score	71.5	3.2	591		0.65						
12. Task-Oriented Leadership Score	54.5	4.5	591		0.75	0.59					
13.Change-Oriented Leadership Score	52.8	5.1	591		0.80	0.75	0.72				
C Controls	**Mean**	**Std.Dev**	**Obs**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**	**21.**
14. DayEpisodeRate	32.9	5.3	591								
15. EmergencyRate	37.1	5.5	591	-0.65							
16. MedianLengthofStay	1.26	44.1	591	0.30	-0.17						
17. MeanAge	52	4.1	591	0.37	0.11	0.22					
18. OccupRate	86.4	5.3	585	-0.15	0.11	0.126	0.02				
19. CapitalInvetm	1,999,783	2,979,602	591	0.04	-0.17	0.041	-0.10	-0.08			
20. TotalBeds	821	385	585	0.09	-0.14	0.022	-0.07	-0.18	0.30		
21. MeanWaiting	48.8	9.1	591	-0.02	-0.05	0.09	0.03	0.07	0.01	-0.03	
22. CaseLoad	22.47	3.95	589	0.06	-0.05	-0.25	0.06	0.018	-0.15	-0.19	0.07

Table 2. NHS Staff Survey Questions relating to Leadership Quality

Relations-oriented leadership style:

1. I know who the senior managers are here (*recognizing*)

My immediate manager...

2. ... encourages those who work for her/him to work as a team (*supporting*, *empowering*)
3. ... can be counted on to help me with a difficult task at work (*supporting*)
4. ... asks for my opinion before making decisions that affect my work (*empowering*)
5. ... is supportive in a personal crisis (*supporting*)
6. … takes a positive interest in my health and well-being (*recognizing*)
7. My appraisal left me feeling that my work is valued by my organisation (*recognizing*, *empowering*)
8. I am satisfied with the support I get from my immediate manager. (*supporting*)
9. Senior managers here try to involve staff in important decisions (*empowering*)
10. My manager supported me to receive this training learning or development (*supporting*, *developing*).

Task-oriented leadership style

11. Communication between senior management and staff is effective (*clarifying, monitoring*)
12. My immediate manager gives me clear feedback on my work (*clarifying*, *monitoring*)
13. The appraisal helped me improve how I do my job (*clarifying, planning*)
14. The appraisal helped me agree clear objectives for my work (*clarifying*)
15. The values of my organisation were discussed as part of the appraisal process (*clarifying*)

Change-oriented leadership style

16. Senior managers act on staff feedback (missing in 2010 and 2011) (*advocating change*)
17. My organizations acts on patient feedback. (*advocating change*)
18. We are given feedback about changes made in response to reported errors, near misses and incidents. (*envisioning change, facilitating collective learning*)
19. Senior managers encourage staff to suggest new ideas for improving services. (missing in 2012, 2013, and 2014) (*encouraging innovation*)
20. As a result of my appraisal, new training, learning or development needs were identified (*envisioning change, advocating change*).
21. When errors, near misses or incidents are reported, my managers takes action to ensure that they do not happen again (*advocating change, facilitating collective learnin*g)

Integrity-oriented leadership style

22. My organisation treats staff who are involved in an error, near miss or incident fairly (*promoting fairness*)
23. My organisation encourages us to report errors, near misses or incidents (*promoting fairness*)
24. My organisation treats reports of errors, near misses or incidents confidentially (*effectively dealing with sensitive situations*)
25. Does your organisation act fairly with regard to career progression / promotion, regardless of ethnic background, gender, religion, sexual orientation, disability or age? (*promoting fairness and equality*)

All survey items have responses ranging either from Strongly Disagree to Strongly Agree or Yes/No. The data downloaded from NHS Staff Survey website is at hospital trust level and demonstrates the proportion of the staff answering either Agree or Strongly Agree to the statement.

Table 3: The Effect of Leadership on Hospital Quality

	Staff-Rated		**Patient-Rated**						**Clinical**
Dependent Variable	(1) RecTreatm	(2) RecWork	(3) Overall	(4) Access	(5) Coordination	(6) Information	(7) Relationships	(8) Comfort	(9) Non-Elective Death Rate
Integrated Leadership	0.334***	0.623***	0.220***	0.099	0.123***	0.282***	0.302***	0.144***	-0.161***
	(0.034)	(0.031)	(0.038)	(0.053)	(0.036)	(0.039)	(0.039)	(0.042)	(0.041)
Relations-Oriented Leadership	0.176***	0.431***	0.188***	0.098*	0.097**	0.210***	0.292***	0.121***	-0.094***
	(0.028)	(0.027)	(0.029)	(0.042)	(0.029)	(0.033)	(0.029)	(0.033)	(0.034)
Task-Oriented Leadership	0.428***	0.669***	0.163***	0.084	0.091*	0.248***	0.173***	0.097*	-0.138***
	(0.036)	(0.036)	(0.047)	(0.061)	(0.041)	(0.048)	(0.050)	(0.048)	(0.048)
Integrity-Oriented Leadership	0.339***	0.543***	0.184***	0.119*	0.118***	0.214***	0.213***	0.124**	-0.080*
	(0.034)	(0.039)	(0.036)	(0.051)	(0.034)	(0.044)	(0.039)	(0.042)	(0.045)
Change-Oriented Leadership	0.361***	0.613***	0.249***	0.087	0.163***	0.311***	0.328***	0.183***	-0.213***
	(0.033)	(0.032)	(0.034)	(0.049)	(0.034)	(0.038)	(0.037)	(0.042)	(0.048)
N	583	583	582	582	582	582	582	582	579

** p<0.10 ** p<0.05 *** p<0.01. Standardized beta coefficients come from separate regressions and are from fixed effect panel regressions; Robust standard errors in parentheses. All regression include the list of controls reported in the Table A2 of the Appendix.*

Table 4: Moderation Analysis between leadership quality and hospital autonomy and competition

	Staff-Rated		**Patient-Rated**						**Clinical**
Dependent Variable	(1) RecTreatm	(2) RecWork	(3) Overall	(4) Access	(5) Coordination	(6) Information	(7) Relationships	(8) Comfort	(9) Non-Elective Death Rate
Int.Leadership	0.381***	0.640***	0.154**	0.097	0.099*	0.204***	0.123**	0.127*	-0.089
IntLead ✕ FT	-0.053	0.019	0.036	-0.016	0.028	0.045	0.093**	0.000	-0.021
IntLead✕Compet	0.005	-0.029	0.040	0.013	-0.013	0.060	0.105**	0.024	-0.093
R.O.Leadership									
R.O.Lead✕FT	0.214***	0.463***	0.140***	0.110	0.095*	0.153***	0.151***	0.092	-0.045
R.O.Lead✕Comp	-0.064*	-0.006	0.014	-0.032	-0.003	0.026	0.073**	-0.003	-0.030
et	0.040	0.016	0.053*	0.021	0.009	0.067*	0.097***	0.047	-0.063
T.O. Leadership									
T.O.Lead ✕ FT	0.499***	0.681***	0.106	0.077	0.054	0.186**	0.017	0.109	-0.136*
T.O.Lead✕Comp	-0.048	0.023	0.043	0.001	0.063	0.037	0.085	-0.003	0.015
et	-0.041	-0.034	0.025	0.012	-0.043	0.057	0.094	-0.007	-0.029
I.O.Leadership									
I.O. Lead ✕ FT	0.405***	0.557***	0.138**	0.191**	0.095	0.173***	0.031	0.090	-0.047
I.O.Lead✕Compe	-0.014	0.028	0.013	-0.053	0.017	0.035	0.048	0.013	-0.016
t	-0.040	-0.008	0.078	0.017	0.023	0.060	0.194***	0.072	-0.029
C.O. Leadership									
C.O. Lead ✕ FT	0.394***	0.635	0.184***	0.126	0.133**	0.229***	0.139***	0.154**	-0.044
C.O.Lead✕Comp	-0.032	0.017	0.029	-0.039	0.015	0.057	0.074*	0.008	-0.043
et	-0.003	-0.029	0.046	0.005	0.008	0.042	0.132***	0.036	-0.152*
N	583	583	582	582	582	582	582	582	579

** p<0.10 ** p<0.05 *** p<0.01. Standardized beta coefficients come from separate regressions and are from random effect panel regressions; Robust standard errors are not reported to fit the results in the table but are available upon request. All regression include the list of controls reported in the Table A2 of the Appendix. Int: integrated leadership, R.O.: relation-oriented, T.O.: task-oriented, I.O.: integrity-oriented, C.O.: change-oriented. FT denotes Foundation Trust hospitals, and Compet is the number of other hospitals in the 30km radius.*

Online Appendix

Table A1. NHS Inpatient Survey questions

Subgrouped by the Care Quality Commission domains
Access
Was your admission date changed by the hospital? (Factor 1: 0.0144; Factor 2: 0.008)
How do you feel about the length of time you were on the waiting list before your admission to hospital? (Factor 1: 0.017; Factor 2:0.017)
From the time you arrived at the hospital, did you feel that you had to wait a long time to get to a bed on a ward? (Factor 1: -0.016, Factor 2: 0.006)
Coordination
Sometimes, a member of staff will say one thing and another will say something quite different. Did this happen to you? (Factor 1: 0.115; Factor 2: 0.008)
On the day you left the hospital, was your discharge delayed by any reason? (Factor 1: 025; Factor 2: -0.001)
Did any member of staff tell you about any danger signals you should watch for after you went home? (Factor 1: 0.005; Factor 2: 0.309)
Information
Were you involved as much as you wanted to be in decisions made about your care and treatment? (Factor 1: 0.071; Factor 2: 0.088)
Did a member of staff explain the purposes of the medications you were to take at home in a way you could understand? (Factor 1: -0.063; Factor 2: 0.211)
Did a member of staff tell you about medication side effects to watch for when you went home? (Factor 1: -0.064; Factor 2: 0.414)
Relationships
When you had important questions to ask the doctor, did you get answers that you could understand? (Factor 1: -0.006; Factor 2: 0.063)
Did doctors talk in front you as if you weren't there? ((Factor 1: 0.248; Factor 2: -0.032)
When you had important questions to ask a nurse, did you get answers that you could understand? (Factor 1: 0.255; Factor 2:-0.038)
Did nurses talk in front of you as if you weren't there? (Factor 1: 0.377; Factor 2: -0.062)
Comfort
Were you ever bothered by noise at night from other patients? (Factor 1: -0.012; Factor 2: 0.004)
Were you ever bothered by noise at night from hospital staff? (Factor 1: 0.005; Factor 2: 0.013)
In your opinion, how clean was the hospital room or ward that you were in? (Factor 1: 0.003; Factor 2: -0.010)
How would you rate the hospital food? (Factor 1: -0.019; Factor 2: 0.007)
Were you given enough privacy when being examined or treated? (Factor 1: 0.036; Factor 2: -0.021)
Overall, did you feel you were treated with respect and dignity while you were in hospital? (Factor 1: 0.043; Factor 2: 0.014)
Do you think the hospital staff did everything they could to help control your pain? (Factor 1: -0.014; Factor 2: 0.0.023)

Note: Each items' loading to our PatientSat1 and PatientSat2 factors are in parentheses.

Table A2: Dependent Variable: Patient Satisfaction Factors

	Factor 1	Factor 2
Integrated Leadership	0.319*** (0.038)	0.202*** (0.366)
Relations-Oriented Leadership	0.310*** (0.029)	0.125 *** (0.030)
Task-Oriented Leadership	0.176*** (0.048)	0.208*** (0.043)
Integrity-Oriented Leadership	0.206*** (0.039)	0.185*** (0.039)
Change-Oriented Leadership	0.344*** (0.037)	0.246*** (0.035)
N	582	582

*The coefficients come from separate regressions, * p<0.10 ** p<0.05 *** p<0.01.. Standardized beta coefficients are from fixed effect panel regressions; Robust standard errors in parentheses. All regression include the list of controls reported in Table A2 of the Appendix.*

Table A3: The effect of Control variables on Dependent Variables

Hospital Quality	**Staff-Rated**		**Patient-Rated**						**Clinical**
Controls	**(1) RecTreatm**	**(2) RecWork**	**(3) Overall**	**(4) Access**	**(5) Coordination**	**(6) Information**	**(7) Relationships**	**(8) Comfort**	**(9) Non-Elective Death Rate**
DayEpsRate	0.037	0.153	0.134	-0.016	0.091	0.148	0.192	0.197*	-0.159
	(0.0815)	(0.121)	(0.110)	(0.130)	(0.121)	(0.107)	(0.116)	(0.113)	(0.116)
EmergRate	0.129*	0.294***	0.101	-0.015	0.047	0.176	0.092	0.150	-0.032
	(0.0735)	(0.112)	(0.119)	(0.117)	(0.134)	(0.118)	(0.130)	(0.136)	(0.134)
MedianLOS	-0.018	-0.041	0.011	-0.004	-0.015	0.013	0.003	0.071	0.150***
	(0.0364)	(0.0457)	(0.0397)	(0.0440)	(0.0516)	(0.0520)	(0.0402)	(0.0454)	(0.0558)
MeanAge	-0.196*	0.218	0.233	0.109	0.257*	0.168	0.418***	0.042	-0.010
	(0.101)	(0.152)	(0.142)	(0.177)	(0.150)	(0.145)	(0.147)	(0.144)	(0.143)
OccupRate	0.046	0.158***	0.013	-0.116***	0.031	0.093**	0.046	-0.009	-0.001
	(0.0334)	(0.0521)	(0.0403)	(0.0428)	(0.0460)	(0.0465)	(0.0454)	(0.0422)	(0.0486)
CapitalInv	-0.016	-0.009	-0.010	-0.014	-0.007	0.010	-0.017	-0.018	-0.012
	(0.0217)	(0.0326)	(0.0170)	(0.0244)	(0.0200)	(0.0336)	(0.0295)	(0.0181)	(0.0272)
TotalBeds	0.103	0.088	-0.236**	-0.424***	-0.111	-0.334**	0.046	-0.151	-0.152
	(0.110)	(0.143)	(0.118)	(0.129)	(0.118)	(0.140)	(0.148)	(0.189)	(0.186)
MeanWait	-0.008	-0.063	-0.027	-0.095	0.003	0.019	-0.013	-0.054	0.011
	(0.0410)	(0.0540)	(0.0670)	(0.0680)	(0.0553)	(0.0907)	(0.0557)	(0.0420)	(0.0377)
CaseLoad	-0.020	-0.102*	-0.151***	0.014	-0.130**	-0.189***	-0.229***	-0.109*	0.296***
	(0.0425)	(0.0532)	(0.0526)	(0.0658)	(0.0508)	(0.0577)	(0.0558)	(0.0554)	(0.0579)
N	583	583	582	582	582	582	582	582	579
R^2_{within}	0.022	0.065	0.047	0.033	0.033	0.055	0.088	0.032	0.082

** p<0.10 ** p<0.05 *** p<0.01.*

Table A4: The Effect of Leadership on Hospital Quality: Feasible Generalized Least Squares Model

	Staff-Rated		**Patient-Rated**						**Clinical**
Dependent Variable	(1) RecTreatm	(2) RecWork	(3) Overall	(4) Access	(5) Coordination	(6) Information	(7) Relationships	(8) Comfort	(9) Non-Elective Death Rate
Relations-Oriented Leadership	0.427***	0.642***	0.238***	0.134***	0.155***	0.302***	0.252***	0.173***	-0.118***
	(0.034)	(0.030)	(0.036)	(0.039)	(0.037)	(0.037)	(0.036)	(0.039)	(0.041)
Task-Oriented Leadership	0.566***	0.733***	0.108***	0.041	0.060	0.241***	0.015	0.088**	-0.053
	(0.034)	(0.030)	(0.039)	(0.041)	(0.040)	(0.040)	(0.040)	(0.042)	(0.043)
Integrity-Oriented Leadership	0.564***	0.653***	0.337***	0.286***	0.236***	0.357***	0.282***	0.288***	-0.080**
	(0.030)	(0.029)	(0.034)	(0.037)	(0.036)	(0.035)	(0.035)	(0.037)	(0.040)
Change-Oriented Leadership	0.561***	0.736***	0.253***	0.144***	0.173***	0.327***	0.216***	0.228***	-0.070*
	(0.031)	(0.027)	(0.036)	(0.039)	(0.037)	(0.037)	(0.037)	(0.039)	(0.041)
Integrated Leadership	0.529***	0.741***	0.168***	0.066	0.103***	0.281***	0.126***	0.132***	-0.082*
	(0.034)	(0.029)	(0.038)	(0.041)	(0.039)	(0.039)	(0.039)	(0.041)	(0.042)
N	583	583	582	582	582	582	582	582	579

** p<0.10 ** p<0.05 *** p<0.01.. Standardized beta coefficients come from separate regressions and are from FGLS panel regressions; Robust standard errors in parentheses. All regression include the list of controls reported in Table A2 of the Appendix.*

Table A5: The Effect of Leadership on Hospital Quality: Arellano–Bover/ Blundell–Bond

	Staff-Rated		**Patient-Rated**						**Clinical**
Dependent Variable	(1) RecTreatm	(2) RecWork	(3) Overall	(4) Access	(5) Coordination	(6) Information	(7) Relationships	(8) Comfort	(9) Non-Elective Death Rate
Relations-Oriented Leadership	0.090**	0.341***	0.125***	0.081	0.007	0.127***	0.271***	0.060	0.027
	(0.035)	(0.036)	(0.032)	(0.050)	(0.034)	(0.037)	(0.034)	(0.038)	(0.044)
Task-Oriented Leadership	0.396***	0.554***	0.009	0.019	-0.054	0.127**	0.055	-0.104	-0.081
	(0.040)	(0.042)	(0.063)	(0.080)	(0.060)	(0.060)	(0.068)	(0.067)	(0.069)
Integrity-Oriented Leadership	0.286***	0.517***	0.107**	0.066	0.011	0.136**	0.213***	0.045	-0.062
	(0.048)	(0.048)	(0.050)	(0.070)	(0.053)	(0.059)	(0.052)	(0.057)	(0.072)
Change-Oriented Leadership	0.337***	0.595***	0.157***	0.115*	0.043	0.204***	0.271***	0.062	-0.130**
	(0.035)	(0.032)	(0.048)	(0.069)	(0.052)	(0.052)	(0.051)	(0.061)	(0.063)
Integrated Leadership	0.278***	0.551***	0.127***	0.091	-0.009	0.185***	0.276***	0.013	-0.034
	(0.038)	(0.034)	(0.047)	(0.067)	(0.047)	(0.050)	(0.051)	(0.055)	(0.056)
	353	353	351	351	351	351	351	351	351

** p<0.10 ** p<0.05 *** p<0.01. Standardized beta coefficients come from separate regressions and are from Arellano-Bond linear dynamic panel data regressions; Robust standard errors in parentheses. All regression include the list of controls reported in Table A2 of the Appendix.*

Table A6: Two Stage Least Squares using Lag of Leadership Quality as an Instrumental Variable

First Stage Results	**Integrated Leadership**	**Relation-Oriented leadership**	**Task-Oriented Leadership**	**Change-Oriented Leadership**	**Integrity-Oriented Leadership**
LaggedLeadership	0.308 (0.055)***	0.047 (0.053)	0.173 (0.060) ***	0.405 (0.052)***	0.081 (0.057)
Prob>F	*0.000*	*0.367*	*0.0044*	*0.000*	*0.1637*
Centered R^2	*0.2061*	*0.1359*	*0.0879*	*0.2725*	*0.1419*
Kleibergen-Paap Wald Stat	*30.83*	*0.815*	*8.217*	*58.617*	*1.948*

Second Stage Results	**(1) RecTreatm**	**(2) RecWork**	**(3) Overall**	**(4) Access**	**(5) Coordination**	**(6) Information**	**(7) Relationships**	**(8) Comfort**	**(9) Non-Elective Death Rate**
Integrated Leadership	0.713 (0.12)***	1.125 (0.135)***	0.608 (0.147)***	0.287 (0.173)*	0.533 (0.159)***	0.738 (0.172)***	0.599 (0.135)***	0.438 (0.154)***	-0.942 (0.235)***
Relations-Oriented Leadership	3.593 (3.78)	5.636 (5.768)	2.923 (3.147)	1.527 (1.76)	2.800 (3.13)	3.489 (3.785)	2.546 (2.623)	1.975 (2.23)	-4.91 (5.06)
Task-Oriented Leadership	1.096 (0.301)***	1.69 (0.39)***	0.969 (0.392)**	0.538 (0.429)	0.784 (0.379)**	1.092 (0.406)***	0.981 (0.393)**	0.810 (0.40)**	-1.171 (0.549)**
Integrity-Oriented Leadership	2.149 (1.386)	2.95 (1.756)*	2.009 (1.41)	1.359 (1.163)	1.854 (1.344)	1.895 (1.36)	1.909 (1.291)	1.55 (1.19)	-2.24 (1.678)
Change-Oriented Leadership	0.537 (0.07)***	0.832 (0.074)***	0.517 (0.111)***	(0.199 (0.138)	0.432 (0.114)***	0.633 (0.135)***	0.586 (0.107)***	0.357 (0.120)***	-0.680 (0.147)***

*Standardized beta coefficients are from instrumented 2SLS panel data regressions; Robust standard errors are in parentheses. The coefficients of second stage results come from separate regressions using the predicted leadership quality measures as independent variables, * p<0.10 ** p<0.05 *** p<0.01. All regression include the list of controls reported in Table A2 of the Appendix.*

Table A7: The relationship between leadership quality measures and managerial redundancy rates

Dependent Variable: **Lag of**	**Number of Managers Promoted (standardized)**	**Number of Managers Dismissed (standardized)**
Integrated Leadership	0.253 (0.059)***	-0.266 (0.101)**
Relations-Oriented Leadership	0.197 (0.045)***	-0.163 (0.063)**
Task-Oriented Leadership	0.209 (0.060)***	-0.176 (0.0787)**
Integrity-Oriented Leadership	0.179 (0.066)***	-0.093 (0.077)
Change-Oriented Leadership	0.257 (0.070)***	-0.155 (0.035)

*Each cell report coefficients from a separate regression, * p<0.10 ** p<0.05 *** p<0.01.. Standardized beta coefficients are from fixed effect panel regressions; Robust standard errors in parentheses. All regression include the list of controls reported in Table A2 of the Appendix.*