Healthy Business?

Managerial Education and Management in Healthcare

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Abstract We investigate the link between hospital performance and managerial education by collecting a large database of management practices and skills in hospitals across nine countries. We find that hospitals that are closer to universities offering both medical education *and* business education have lower mortality rates from Acute Myocardial Infarction (heart attacks), better management practices and more MBA trained managers. This is true compared to the distance to universities that offer only business or medical education (or neither). We argue that supplying bundled medical and business education may be a channel through which universities improve management practices in local hospitals and raise clinical performance.

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1. INTRODUCTION

Across the world, healthcare systems are under severe pressure due to aging populations, the rising costs of medical technologies, tight public budgets and increasing expectations. Given the evidence of enormous variations in efficiency levels across different hospitals and healthcare systems, these pressures could be mitigated by improving hospital productivity. For example, high-spending areas in the U.S. incur costs that are 50% higher than low-spending ones (Fisher et al., 2003, in the "Dartmouth Atlas").[1] Some commentators focus on technologies (such as Information and Communication Technologies) as a key reason for such differences, but others have focused on divergent preferences and human capital among medical professionals (Phelps and Mooney, 1993; Eisenberg, 2002; Sirovich et al., 2008). One aspect of the latter are management practices such as checklists (e.g. Gawande, 2009).

In this paper we measure management practices across hospitals in the US and eight other countries using a survey tool originally applied by Bloom and Van Reenen (2007) for the manufacturing sector. The underlying concepts of the survey tool are very general and provide a metric to measure the adoption of best practices over operations, monitoring, targets and people management in hospitals.

[1] Annual Medicare spending per capita ranges from $6,264 to $15,571 across geographic areas (Skinner et al, 2011), yet health outcomes do not positively co-vary with these spending differentials (e.g. Baicker and Chandra, 2004; Chandra, Staiger, Skinner, 2010). Finkelstein, Gentzkow and Williams (2016) estimate that at least half of these effects arise from place-based supply factors rather than unobserved patient-specific health and demand factors.

We document considerable variation in management practices both between and within countries. Hospitals with high management scores have high levels of clinical performance, as proxied by outcomes such as survival rates from emergency heart attacks (acute myocardial infarction or AMI). These hospitals also tend to have a higher proportion of managers with greater levels of business skills as measured by whether they have attained MBA-type degrees.

To further investigate the importance of the supply of human capital on managerial and clinical outcomes we draw on data from the World Higher Education Database (WHED) which provides the location of all universities in our chosen countries (see Valero and Van Reenen, 2016). We calculate geographical closeness measures (the driving times from a hospital to the nearest university) by geo-coding the location of all hospitals and universities in our sample. We show that hospitals that are closer to universities offering *both* medical and business courses within their premises have significantly better clinical outcomes and management practices than those located further away. This relationship holds even after conditioning on a wide range of location-specific characteristics such as average income, population density and climate. By contrast, the distance to universities with only a business school, only a medical school, or neither (as in a pure liberal arts college offering only arts, humanities, or religious courses) has no significant relationship with management quality, suggesting that the results are not entirely driven by unobserved heterogeneity in location characteristics correlated with educational institutions.

Proximity to schools offering bundles of medical and managerial courses is positively associated with the fraction of managers with formal business education (MBA-type courses) in hospitals, consistent with the idea that the courses increase the supply of employees with these combined skills. We do not have an instrumental variable for the location of universities, and cannot therefore demonstrate that the correlations are causal. Nevertheless, these results are suggestive of a strong—and so far unexplored—relationship between managerial education and hospital performance.

Our paper relates to several literatures. First, the paper is related to the literature documenting the presence of wide productivity differences across hospitals. Chandra et al (2016) estimate a large heterogeneity in hospital "Total Factor Productivity" across U.S. hospitals of an order of magnitude similar to the magnitude documented in manufacturing and retail. We contribute to this literature by suggesting that management—and, indirectly—management education may be a possible factor driving the productivity dispersion via its effect on management practices. Second, our paper contributes to the literature on the importance of human capital (especially managerial human capital) for organizational performance. Examples of this work would include Bertrand and Schoar (2003) for CEOs, Moretti (2004) for ordinary workers, and Gennaioli et al (2013) at the regional and national levels. More specifically Doyle, Ewer and Wagner (2010) examine the causal importance of physician human capital on patient outcomes. Finally, this paper is related to the work on measuring management practices across firms, sectors and countries—for example, Osterman (1994), Huselid (1995), Ichniowski, Shaw and Prenushi, (1997), Black and Lynch (2001) and Bloom et al (2014).

The structure of the paper is as follows. In section 2 we provide an overview of the methodology used to collect the hospital management data, the health outcomes data, the skills data as well as other data used in the analysis. Section 3 describes the basic summary statistics emerging from the data, Section 4 presents the results and Section 5 concludes. The online Appendices give much more detail on the data (A), additional results (B), sampling frame (C) and case studies of management practices in individual hospitals (D).

2. DATA

2.1. Collecting Measures of Management Practices across Countries:

To measure hospital management practices, we adapt the World Management Survey (Bloom and Van Reenen 2007, Bloom et al 2014) methodology to healthcare. This is based on the work of international consultants and the healthcare management literature.

The evaluation tool scores a set of 20 basic management practices on a grid from one ("worst practice") to five ("best practice") in four broad areas: operations (4 questions), monitoring, (5 questions), targets (5 questions) and human resource management (6 questions). The full list of dimensions can be found in Appendix Table A1.

Hospitals with very weak management practices (score of 2 or below) have almost no monitoring, very weak targets (e.g. only an annual hospital-level target) and extremely weak incentives (e.g. tenure-based promotion, no financial or non-financial incentives and no effective action taken over underperforming medical staff). In contrast, hospitals with a score of 3 or above have some reasonable and proactive performance monitoring, processes in place for continuous improvement, a mix of targets covering a broad set of metrics and time scale, performance-based promotion, and systematic ways to address and correct persistent underperformance. To compute the main management practices score used in our regression analysis, we standardize the index to have zero mean and standard deviation of one by z-scoring the average of the z-scores of the 20 individual management questions.

The data was collected for Canada, France, Italy, Germany, Sweden, U.S and U.K. (in 2009); India (2012); and Brazil (2013). For the U.K. we combine two waves of the survey (2006 and 2009).[2] The choice of countries was driven by funding availability, the availability of hospital sampling frames, and research and policy interest.

In every country the sampling frame for the management survey was randomly drawn from administrative register data and included all hospitals that (i) have an Orthopedics or Cardiology Department, (ii) provide acute care, and (iii) have overnight beds. Interviewers were each given a random list of hospitals from a sampling frame representative of the population of hospitals with these characteristics in the country..[3] Within each department, we targeted the director of nursing, medical superintendent, nurse manager or administrator of the specialty, that is, the clinical service lead at the top of the specialty who is still involved in its management on a daily basis.

[2] The 2006 U.K. data has been used in Bloom et al (2015).

[3] During the survey, if the hospital did not have an Orthopedics department, or if the manager in this department was not available, we then tried to get in touch with Cardiology. In our sample, there are 937 observations for Multi-Specialty departments, 460 observations for the Orthopedics department, 262 for Cardiology, 138 for Surgery when Orthopedics or Cardiology related-procedures were carried out in the Surgery department, 163 for other departments that still carried out Orthopedics or Cardiology related-procedures when the departments mentioned above did not exist in the hospital (the rest is Surgery/other).

We used a variety of procedures to persuade hospital employees to participate in the survey. First, we encouraged our interviewers to be persistent – they ran on average two interviews a day which lasted for an average of an hour each. Second, we never asked hospital managers about the hospital's overall performance during the interview (these were obtained from external administrative sources). Third, we sent informational letters, and, if necessary, copies of country endorsements letters (e.g. UK Health Department).

Following these procedures helped us obtain a reasonably high response rate of 34%, similar to the response rates for our manufacturing and school surveys. The country-specific response rates ranged from 66%, 53% and 49% of eligible hospitals in Sweden, Germany, and Brazil, down to 21% of eligible hospitals in the US.[4] In terms of selection bias, we compare our sample of hospitals for which we secured an interview with the sample of all eligible hospitals in our sampling frame for each country on dimensions such as size, ownership and geographical location. Looking at the overall pattern of results, we obtain few significant coefficients with marginal effects small in magnitude.[5] We further construct sampling weights and observe that our main unweighted results hold even when using this alternative sample weighting scheme. We describe our selection analysis as well as the sampling frame sources and response rates in more detail in Appendix C.

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[4] This was mainly due to not completing all the interviews (due to rescheduling) rather than outright refusals. The explicit refusal rate was 11%, ranging from no refusals in hospitals in Sweden to 22% of all eligible hospitals in Germany.

[5] For example, there were higher response rates in India for certain locational characteristics population density, education and located farther away from coast);, in the US for public hospitals, and in Germany and Italy for hospital size.

To elicit candid responses, we took several steps. First, our interviewers received extensive training in advance on hospital management. Second, we also employed a double-blind technique: interviewers are not told in advance about the hospital's performance – they only had the hospital's name and telephone number – and respondents are not told in advance their answers are scored. Third, we told respondents we were interviewing them about their hospital management, asking open-ended questions like "*Tell me how you track performance?*" and "*If I walked through your ward what performance data might I see?*". The combined responses to these types of questions are scored against a grid. For example, these two questions help to score question 6, *performance monitoring*, which goes from 1, which is defined as *"Measures tracked do not indicate directly if overall objectives are being met. Tracking is an ad-hoc process (certain processes aren't tracked at all)*", to 5 defined as "*Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools.*" Interviewers kept asking questions until they could score each dimension.

Three other steps to guarantee data quality were firstly, each interviewer conducted on average 39 interviews in order to generate consistent interpretation of responses. They received one week of intensive initial training and four hours of weekly on-going training;[6] Secondly, 70% of interviews had another interviewer silently listening and scoring the responses, which they discussed with the lead interviewer after the end of the interview. This provided cross-training, consistency and quality assurance. Thirdly, we collected a series of 'noise controls', such as interviewee and

[6] See, for example, the video of the training for our 2009 wave http://worldmanagementsurvey.org/?page_id=187

interviewer characteristics. We include these controls in the regressions to reduce potential response bias.

We describe the country sampling frames, their sources, and eligibility criteria in Appendices A and C. Some hospitals are part of larger networks, so in our analysis we cluster standard errors by hospital network to take into account potential similarities across these hospitals.[7]

2.2. Collecting Hospital Health Outcomes

Given the absence of publicly comparable measures of hospital-level performance across countries, we collected country-specific measures of mortality rates from AMI (acute myocardial infarction, commonly called heart attacks). AMI is a common emergency condition, recorded accurately and believed to be strongly influenced by the organization of hospital care (e.g. Kessler and McClellan 2000), and used as a standard marker of clinical quality. We tried to create a consistent measure across countries, although there are inevitably some differences in construction so we include country dummies in almost all of our specifications.[8] We observe substantial differences in spread of this measure across countries—the country specific coefficient of variation

[7] In the UK sample we have two years (2006 and 2009), so clustering also deals with serial correlation over time in the same network.

[8] For Brazil we compute a simple risk-adjusted measure by taking the unweighted average across rates for myocardial infarction specified as acute or with a stated duration of 4 weeks or less from onset for each rage-gender-age cell for each hospital for the years of 2012 and 2013. For Canada, we use risk-adjusted rate for acute myocardial infarction mortality for the years 2004-2005, 2005-2006 and 2006-2007. For Sweden, we use 28-day case fatality rate from myocardial infarction from 2005 to 2007. For the US, we use the risk-adjusted 30-day death (mortality) rates from heart attack from July 2005 to June 2008. For the UK we use 30 day risk adjusted mortality rates purchased from the company "Dr Foster", the leading provider of NHS clinical data. (See Appendix A for more information and sources). For each hospital, we consider three years of data (the survey year plus two years preceding, or the closest years to the survey with available data) to smooth over possible large annual fluctuations.

is 0.51 for Brazil, 0.52 for Canada, 0.21 for Sweden, 0.10 for the U.S. and 0.34 (2006) and 0.15 (2009) for the U.K.

2.3. Classifying Differences across Universities

In the WHED we can distinguish whether universities offer courses in Business (Management, Administration, Entrepreneurship, Marketing and/or Advertising), Medical (Clinical), and Humanities (Arts, Language and/or Religion) and a range of other "divisions" (see Feng, 2015; Valero and Van Reenen, 2016). We geocode the location of each school using their published addresses and compute drive-times between hospitals and universities of different types using GoogleMaps. The computation of travel times is restricted to hospitals and universities in the same county (see Appendix A for a more detailed explanation).

2.4. Collecting Location Characteristics Information

Using the geographic coordinates of hospitals in our sample, we also collected a range of other location characteristics. At the sub-national regional level (e.g. states in the US), we use the variables provided in Gennaioli et al (2013).[9] For data at the grid level, we construct a dataset based on the G-Econ Project in Yale that estimates geographical measures for each grid cell which represents one degree in latitude by one degree longitude. Table B1 presents descriptive statistics for the sets of location characteristics used in this analysis.

3. DESCRIPTIVE STATISTICS

[9] The regional data from Gennaioli et al (2013) consists of NUTS1, NUTS2, State or Provincial level, depending on the country.

3.1 Variation in Management Practices

Table 1 shows some descriptive statistics and Figure 1 shows the differences in management scores across countries ((which is the simple average of the questions ranging between 1 and 5). The US has the highest management score (3.0), closely followed by the UK, Sweden, and Germany (all around 2.7) with Canada, Italy, and France slightly lower (at around 2.5). The emerging economies of Brazil (2.2) and India (1.9) have the lowest scores.[10] The rankings do not change substantially (except for Sweden which rises to the top) when we include controls for hospital characteristics and interview noise. Country fixed effects are significant (p-value on the F-test of joint significance is 0.00) and account for 32% of the variance in the hospital-level management scores, which is a greater fraction than for manufacturing firms, where the figure is 25% for the same set of countries.[11]

Figure 2 shows the distribution of management scores within each country compared to the smoothed (kernel) fit of the US distribution. Across OECD countries, lower average country-level management scores are associated with an increasing dispersion towards the left tail of the distribution. While the fraction of hospitals with very weak management practices in OECD countries is small (from 5% in the US to 18% in France), this fraction rises to 45% in Brazil and

[10] In the Appendix, we provide examples of management practices in the average hospital in the US (at the top of the ranking) and in India (at the bottom of the ranking).

[11] One possible explanation is that manufacturing firms often produce an internationally traded good so firms are more globally exposed while hospitals serve local national markets. Table C2 presents hospital characteristics across countries. Although there are many differences in cross country means (e.g. the median French hospital has 730 beds compared to 45 in Canada), within all countries non-responders were not significantly different from participating hospitals. Characteristics are different because the healthcare systems differ, and our sample reflects this.

68% in India. At the other end of the distribution, the fraction of hospitals with a score 3 or above ranges from 50% in the US to 3% in India.

In Figure 3 we report the coefficients and confidence intervals of regressions of the management score on hospital characteristics when country dummies and noise controls are included (the diamond marker indicates the coefficient when these variables are included one by one, while the square marker indicates the coefficient when they are jointly included as regressors). Larger hospitals (where size is proxied by the log of number of beds) tend to have higher management scores, whereas government run hospitals tend to have lower management scores relative to for private-for profit and private-not for profit hospitals. Bloom, Propper, Seiler, and Van Reenen (2015) show causal evidence of the impact of higher competition on improved managerial quality in English hospitals. Consistently with this earlier research, we find that the self-reported measure of competition[12] we collected during the interview is positively and significantly correlated with the management score. The magnitude and significance of these correlations is largely unchanged when these variables are jointly included in the regression.

3.2 AMI Mortality Rates and Management

As an external validation of our management measure across countries, we investigate whether management is related to clinical outcomes. Table 2 shows that management practices are significantly negatively correlated with AMI mortality rates.[13] In column (1) the management

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[12] Our measure of competition is collected during the survey by asking the interviewee 'How many other hospitals with the same specialty are within a 30-minute drive from your hospital?'

[13] Note that we can only do this for a sub-set of hospitals (478 from the total of 1960 observations), as AMI data is not available for all hospitals. The results discussed in this section—and in

coefficient suggests that a one standard deviation increase in a hospital's management score is associated with a fall of -0.188 standard deviations in AMI deaths rates, and this relationship holds even after controlling for a wide variety of factors. Column (2) includes a measure of size (hospital beds), ownership dummies (for-profits; non-for-profit and government owned), local competition faced by the hospital and statistical noise controls. Column (3) includes regional geographic controls (income per capita, education, population density, climate, ethnicity, etc.). Column (4) includes regional dummies, and column (5) uses more disaggregated geographical controls. Although the coefficient on management varies between columns (from -0.188 to -0.223), it is always significant at the 1% level.

In additional analysis (available upon request) we investigated whether the relationship between AMI mortality rates and management was heterogeneous across countries: overall the results indicate that the coefficients are in fact similar across countries. Further, to provide a sense of the magnitudes implied by these coefficients, we re-run this regression using raw (i.e. non z-scored) AMI mortality rates on the US sample, which provides the largest number of hospitals with risk-adjusted AMI data. In this sample, a one standard deviation change in the management score is associated with a reduction of 0.320 (standard error 0.173) in the AMI mortality rate. This third of a percentage point fall in AMI death rates compares to a mean of 16% and a standard deviation of 1.75 (implying a share of the standard deviation of 0.18 = 0.32/1.75, near identical to the pooled correlation in column (1) of Table 2).[14]

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particular the relationship between AMI mortality rates and management—are similar if we focus only on the Cardiology subsample.

[14] For comparison, we also repeated this analysis on the second largest sample with AMI data, Brazil (109 observations) where, however, we could only retrieve non-risk adjusted AMI rates. In this sample, a standard deviation change in management is associated with a 2.404

Table 2 is broadly consistent with findings from prior quantitative work in this area. For example, Bloom et al (2015) look at management practices in English hospitals in 2006 and also find a positive link between management and hospital performance such as survival rates from general surgery, lower staff turnover, lower waiting lists, shorter lengths of stay and lower infection rates. McConnoll et al (2012) document a negative and significant relationship between management (measured using the WMS survey instrument) and AMI mortality rates in the context of 597 cardiac units in the US. Chandra et al (2016) look at the WMS management scores and risk-adjusted AMI mortality in US hospitals and also report a negative relationship.

The correlations described so far are also in line with existing qualitative studies documenting a positive association between specific aspects of a hospital's organizational culture and AMI mortality rates. For example, in depth qualitative studies (Bradley et al 2001) document that hospitals with better performance in terms of adoption of β-blockers (used to reduce mortality and future cardiac events after AMI) and lower AMI mortality rates tend to have clear and well-communicated goals throughout the organization, make systematic use of problem solving tools (such as "root cause analysis"), have greater reliance on data as well as stronger communication and coordination routines relative to low-performing hospitals. These studies also observe that the presence of these different approaches is not fully captured by surveys that simply track adoption of specific clinical protocols or checklists: this is because, while these standardized tools are reported to be widely used in both high and low performing organizations, there can still be wide

decrease in the AMI rate (standard error 0.914), which corresponds to 29% of the standard deviation of the variable (8.23).

variation in the ways in which they are implemented. The results are also consistent with the case-study evidence on hospitals like Virginia Mason (Kenney, 2015), ThedaCare (Toussaint, 2016) and Intermountain (Leonhardt, 2009) that are famous for adopting the types of management practices that we include in the survey, and for having better clinical outcomes.

While the causal channels are yet to be fully established—and cannot be discerned in the qualitative research mentioned above or in our sample given the cross-sectional nature of the data—these studies suggest that differences in basic processes and practices such as the ones captured in the WMS instrument may contribute to better clinical performance by focusing attention and resources towards the issue of the quality of care; reducing the likelihood of preventable deaths and medical errors, which are often related to poor communication or imperfect transitions of care; and helping identify and address the inevitable complexities and risks that arise in patients hospitalized with AMI.

4. The Role of Managerial Education

In this section we explore a possible factor behind the variation in management across hospitals, and the relationship between the management score and AMI mortality rates: differences in managerial education opportunities among clinical managers.

Exposure to basic managerial training among individuals involved in health care provision is generally low in the US (Myers and Pronovost, 2017). While comparable international information on managerial training received by health care professionals is not available, data collected within the management interviews allows us to provide some basic information on the presence and heterogeneity of managerial training among clinical managers employed in acute care hospitals. In particular, we asked the interviewee "What percentage of managers have an MBA?", asking the interviewer to include in their calculation management-related courses that are at least 6-months long (this would include, for example executive education courses that do not lead to a formal MBA degree, such as Johns Hopkins' Master of Science in Health Care Management or Georgetown's Certificate in Business Administration at the School of Continuing Studies.). On average 26% of managers are reported to have received managerial training, with a standard deviation of 0.29.

Perhaps unsurprisingly, the variable measuring the share of managers in the hospital who have attended an MBA-type course is positively and significantly correlated with the management score. For example, in a regression model including as additional controls country dummies, proxies for interview noise and the hospital characteristics examined in Figure 2 (hospital size, ownership dummies and local competition), a 10% increase in the managerial skills variable (e.g. the average hospital moves from having 26% to 28.6% of managers with a MBA-type course) is associated with 0.059 of standard deviation increase in the management score.

Since the fraction of managers with an MBA-type degree in the hospital is likely to be endogenous to the quality of management practices adopted in the hospital, in order to better identify the role of managerial training *per-se* we now turn to analyze alternative—and arguably more exogenous—proxies for the supply of managerial human capital in the hospital. More specifically, we focus on the distance between the hospital and universities. We start by considering the role of *all* universities (many of which we do not expect to have any particular correlation with clinical outcomes), and then focus on universities offering both clinical and managerial education as the closest proxy for the courses that would result in a higher supply of managerially trained clinical managers and, potentially, with better clinical outcomes.

Table 3 starts by exploring the relationship between these distance metrics and AMI mortality. Column (1) of Table 3 regresses AMI mortality rates on driving hours to the nearest university.[15] Although there is a positive coefficient on distance to a university, it is statistically insignificant. In columns (2) and (3) we focus on a much more specific variable, namely the distance to universities offering both medical and business courses (henceforth, "*Joint M-B school"*).[16] Since there could be unobserved heterogeneity specific to university locations confounding the relationship between hospital performance and the distance to universities, we also include driving distance to universities specializing solely on arts, humanities or religious courses ("*stand-alone HUM"*) and therefore not offering clinical/medical or business-type courses (and expect to find no significant relationship between these universities and hospital performance). To validate the use of this type of school as a placebo, Figure 4 shows that the nearest *stand-alone HUM school* and *joint M-B school* are similar in proximity to the hospitals in our sample: 82% of hospitals have a driving time difference of two hours or less between these two types of universities. We also observe that the means of a range of location characteristics of the nearest *joint M-B school* and *stand-alone HUM school* are not statistically significant (in Table B2).[17] Finally, we also include

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[15] The average driving time between hospitals and universities is 37 minutes with a median of 19 minutes.

[16] We calculate driving distances from each hospital to the nearest *joint M-B school,* which is 67 minutes on average. The results are qualitatively and quantitatively similar if we run this regression on the subsample of hospitals with AMI data.

[17] The only measures that are statistically significant are latitude and longitude.

the drive time to universities that do *not* offer medical, business or humanities[18] ("*no M, B, HUM*"). We find that AMI mortality rates are positively and significantly correlated with the driving distance to a *joint M-B school*—a 10% increase in the drive time to a *joint M-B school* is associated with an increase in AMI mortality rates by 0.039 standard deviations. Reassuringly, we do not observe a significant relationship between management and the other university types. Column (3) shows that the relationship between AMI mortality rates and driving distance to a joint M-B school is essentially unchanged when we include a range of geographic characteristics in our specification (such as income, education, population and temperature).

The significance of the *joint M-B school* in the AMI regressions of Table 3 may be due to other nearby universities that do not have medical/clinical or business courses, but offer other types of quantitative courses (such as engineering). To investigate this issue, we calculated distances to other schools such as (i) the nearest university offering business courses but no medical/clinical courses ("*B school, no M*"), (ii) the nearest university offering medical/clinical courses but not business courses ("*M school, no B*"), and (iii) the nearest university offering other courses but no business nor medical courses ("*nearest school, no M nor B*"). Figure 5 shows that the distributions are similar across all types of schools. In column (4) of Table 3, we include variables measuring driving distances to all four types of schools. The distance to *joint M-B* schools has explanatory power over and above distances to other school types, and has a coefficient similar to the previous column in terms of magnitude. Since none of these other school types are individually or jointly

[18] For example, a stand-alone law school, polytechnic school, religious school, or art school.

significant (see the bottom rows of the relevant columns) we drop them in column (5), which is our preferred specification.[19]

Table 4 explores the relationship between distance to universities and the management practices score — the specifications are the same as for Table 3, but with a different dependent variable. There is a negative correlation between distance to the nearest university and management practice scores. As with Table 3, columns (2), (3) and (4) show that it is only *joint M-B* schools that has explanatory power over and above distances to other school types. The results in our preferred specification in column (5) suggest that a 10% increase in drive time to a *joint M-B school* is associated with a decrease in hospital management quality of 0.014 of a standard deviation. These results are qualitatively and quantitatively unchanged when we focus on the sub-sample of hospitals with AMI data.[20]

4.3 Robustness Checks

We investigate the robustness of the relationships discussed in Tables 3 and 4 to several potential concerns. Some of these robustness checks are shown in Table 5. First, the distance from schools offering medical/clinical course may reflect unobservable school characteristics other than the supply of managerial education directed at clinicians, and correlated with both clinical quality and

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[19] To get a sense of these magnitudes, we estimated the relationship between AMI mortality rates and the distance from the closest universities offering M+B courses on the US sample, using the raw (i.e., non z-scored) AMI rates as a dependent variable. In this sample, a 1% increase in distance to the closest M+B school is associated with a 1 point increase in AMI rate (57% of a standard deviation). When we repeated the same exercise in Brazil (109 observations) using the raw non-risk adjusted AMI rates, the coefficient implies that 1% increase in the distance metric is associated with a 3.675 increase in AMI mortality rates (45% of a standard deviation).

[20] The relationship between Management and the distance metric is -0.208 (standard error 0.102) in the AMI subsample.

management. For example, institutions offering both medical and business education may be systematically different from those who do not in terms of their quality. To look into this issue, we investigated whether schools offering medical and business training are associated with proxies for higher school quality. This analysis is shown in Appendix Table B3. Schools offering medical and business training are indeed older, more likely to be listed in the Quacquarelli Symonds World University Ranking (QSWUR) in 2011, and more likely to offer postgraduate degrees. Columns (1) and (6) include these additional controls for school quality and although some of them are significant their inclusion does not affect the magnitude or significance of the coefficient on the distance to joint M-B schools in either the AMI or the management regressions.

A second issue us that geographical areas with universities offering both clinical and managerial education might be systematically different from those that do not provide these schools—for example, unobserved heterogeneity in income levels might drive both better clinical outcomes and higher levels of the management score.[21] This could bias our results to the extent that the regional controls included in our analysis are not able to capture these finer differences in geographical characteristics. Columns (2) and (7) of Table 5 include regional dummies[22] in the specification and shows that the coefficient on distance to a joint M-B school is still statistically significant when these controls are included.

[21] Differences in income per capita across areas may also affect the quality of emergency care infrastructures across hospitals, thus reducing the speed of arrival of patients at the hospital and improving their clinical outcomes.

[22] Within-country regional dummies are of a full set of dummies at the NUTS 2 level for France, Germany, Italy, Sweden and the UK, and an equivalent state- or provincial-level division for Brazil, Canada, India, and the US.

Third, we also investigated the robustness of the relationship between AMI mortality rates and the distance metric to the inclusion of county-level Census-based controls for differences in the skill composition, employment composition in manufacturing and healthcare, unemployment rate, employment growth rate and per capita income levels. We performed this analysis for the population of US hospitals thanks to the availability of both AMI data and detailed Census variables (this analysis does not require the availability of the management data, hence the larger sample).[23] When using the specification of column (5) in Table 3 on this US sample, the coefficient (standard error) on distance is 0.454 (0.111). When we include HRR dummies in column (3) of Table 5, the coefficient on the distance metric decreases slightly to 0.404 and when we include county level controls in column (4) the coefficient (standard error) drops to 0.232 (0.125). Overall, these results suggest that, while important, regional differences cannot fully account for the relationship between clinical outcomes and the availability of schools offering managerial and clinical education.

Finally, we checked whether the robustness of the relationship between AMI mortality rates and the distance metric captured unobservable characteristics of the parent organization (for example, better managed chains of hospitals may proactively locate their hospitals in areas providing a greater supply of clinicians with managerial training). To do so, we focused again on the US sample, where we could obtain close to population information of network affiliations using the AHA register and, within the US, on the hospitals in the sample that belong to networks. Within

[23] We use a sample of hospitals in the US for which AMI measures are reported in 2009, our year of reference for the OECD countries. We approximate the sample used in the US to the cross-country sample used in this paper by excluding sole community providers and hospitals operated by the Catholic Church.

this sample, we added to the specification network fixed effects in column (5) of Table 5. This exploits within network variation in AMI mortality rates and distance to schools, thus controlling for possible network-level confounders (the sample is smaller as we require at least two hospitals in the chain for which performance data was available).[24] These results confirm that distance to *joint M-B schools* is associated with higher AMI mortality rates.[25]

Overall, these basic robustness checks provide reassurance that the relationship between the distance metrics and our variables of interest does not proxy for basic differences in university quality, regional characteristics and network level heterogeneity.

4.4 Business education

What could be the reason for the relationship between distance from universities providing medical and business education and better hospital outcomes (in terms of AMI survival rates and management practices)? One obvious mechanism is that there is a greater supply of workers with managerial skills when a hospital is close to a *joint M-B school.*

[24] This is analogous to a manufacturing context where one could use plant-specific variation within a firm (i.e. firm fixed effects with plant level data).

[25] We also repeat the specification in column (8) but add HRR fixed effects to check if our results are robust to market characteristics and find similar results. Using a larger UK sample, we explore another dimension of hospital performance: the average probability of staff intending to leave in the next year as a measure of worker job satisfaction for the U.K. reported by the NHS staff surveys and used on Bloom et al (2015). Reassuringly, we find similar patterns to those described in Table 3, indicating a significant positive correlation between distant to the nearest joint M-B school and the likelihood of the average employee wanting to leave the hospital.

In Figure 6 we investigate the relationship between the share of managers with an MBA type degree and the hospital's closeness to a *joint M-B school* (left hand side).[26] There is a clear downwards slope – being closer to these types of schools is associated with a higher fraction of managers with MBAs. By contrast, the right-hand side panel of Figure 5, shows that there is no relationship between the share of MBAs and the distance to *stand-alone HUM* schools. We formalize Figure 5 in Appendix Table B.5. Consistent with the two earlier tables, closeness to a *joint M-B school* (but not other types of school) is associated with significantly more hospital managers with business education.[27]

5. CONCLUSIONS

We have collected data on management practices in 1, 960 hospitals in nine countries. We document a large variation of these management practices within each country and find that our management index is positively associated with improved clinical outcomes as measured by survival rates from AMI.

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[26] All variables in Figure 5 are orthogonalized off geographical controls through a first stage regression.

[27] One way to bring these ideas together is by instrumenting the share of MBA with the distance to a joint M-B school reflecting the idea that proximity increases the managerial skill supply, which in turn benefits hospital performance. If the only way that university proximity matters is through skill supply this should identify the causal impact of managerial education on hospital performance. With the important caveats that the exclusion restriction may not be valid (as universities could in principle affect hospitals through other routes than the supply of human capital) and that the instrument is not strong, we observe that results are consistent with a large causal effect (see Appendix Table B4).

We show evidence that a hospital's proximity to a university which supplies joint business and clinical education is associated with a higher management practice score (and better clinical outcomes). Proximity to universities that do *not* have medical schools or do *not* have business schools does not statistically matter for hospital management scores, suggesting that the bundle of managerial and clinical skills has an impact on hospital management quality. We find that hospitals which are closer to the combined clinical and business schools also have a higher fraction of managers with MBAs which is consistent with this interpretation.

Our work suggests that management matters for hospital performance and that the supply of managerial human capital may be a way of improving hospital productivity. Given the enormous pressure health systems are under, this may be a complementary way of dealing with health demands in addition to the usual recipe of greater medical inputs.

The cross-sectional nature of our data does not allow us to rule out sophisticated sources of endogeneity, including the possibility that universities may create managerial programs catered to clinicians in response to the presence of a high quality hospital in the area. Panel and/or experimental evidence would help to track out causal impacts. Such evidence from either randomized control trials or natural experiments is an obvious next step in this agenda. Furthermore, the current data consist primarily of one observation per hospital, under the assumption that different departments and hierarchical levels within a specific hospital should share broader organizational characteristics. Future research should explore this assumption empirically, and investigate in further detail the scope for managerial differences not only across, but also *within* hospitals. Finally, it would be valuable to study in much more detail the relationship between "basic" management practices and the implementation of specific clinical protocols (e.g. surgery check lists) to develop a better understanding of the way in which management affects the day by day routines of clinicians. We leave these exciting topics for further research.

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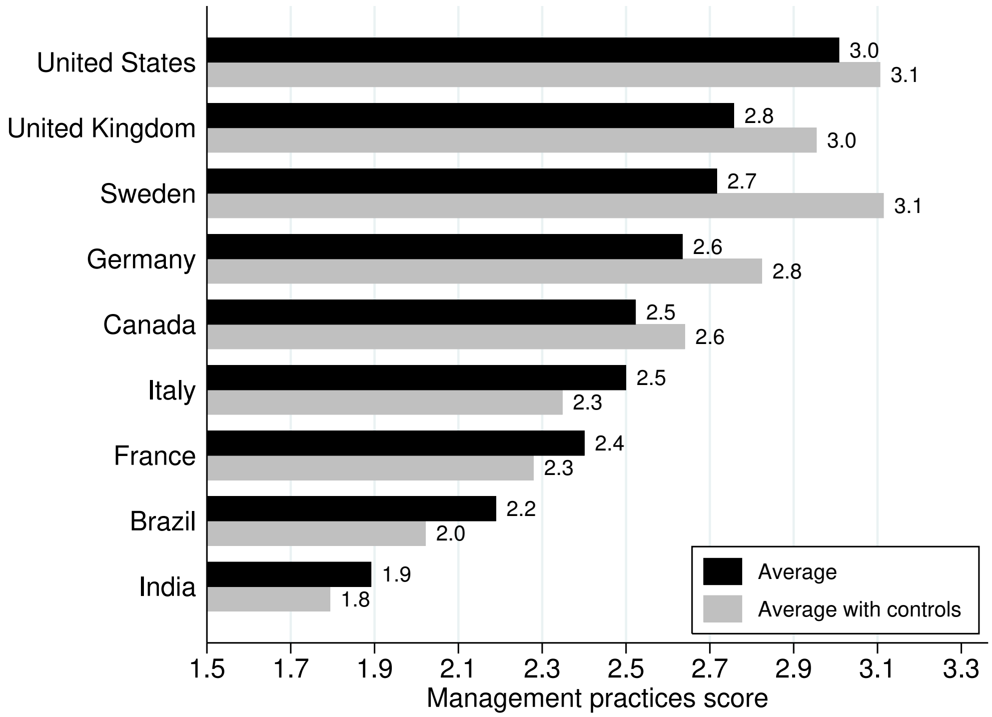
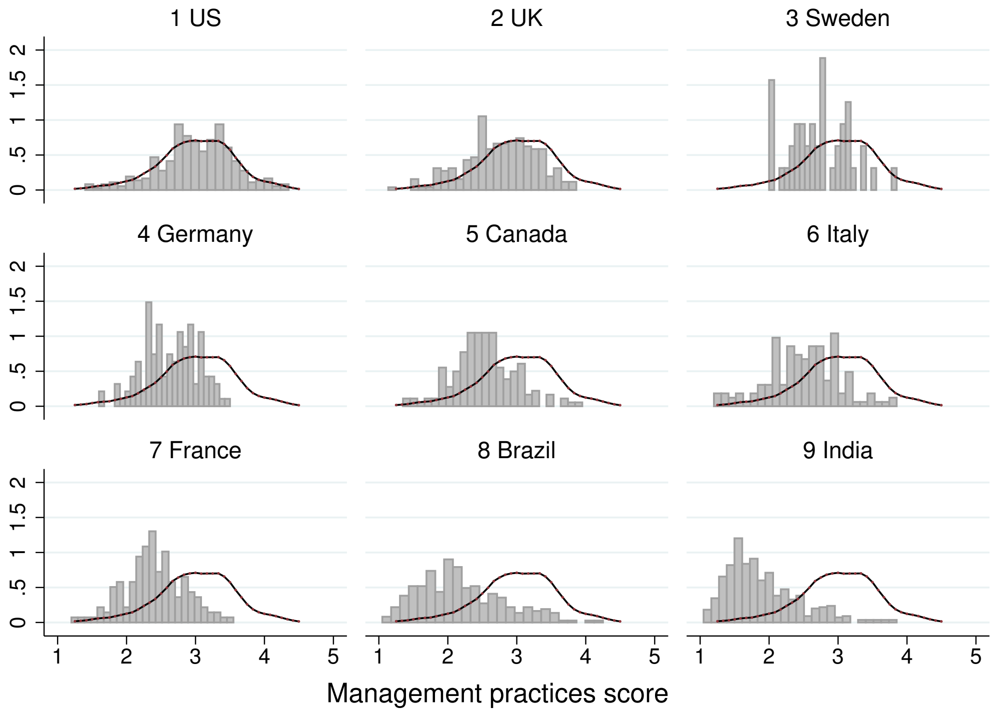
Figure 1: Management practices across countries



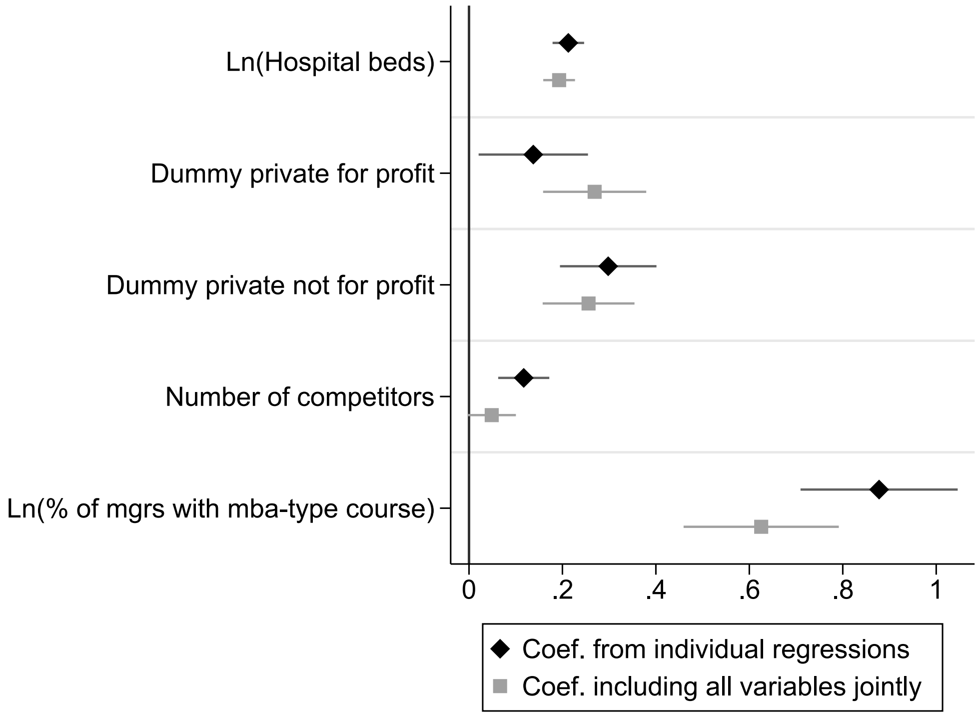
Notes: This figure shows the country average management score on a scale of 1 to 5 (all 20 individual questions are averaged within a hospital and then the unweighted average is taken across all hospitals within a country). The dark bar is this simple average and the lighter grey bar controls for various characteristics. Controls include log of the number of hospital beds, ownership (for-profit; nonprofit and government), survey noise controls (interviewee seniority, tenure, department and type - nurse, doctor or non-clinical manager; interview duration and year; an indicator of the reliability of the information (as coded by the interviewer), and 21 interviewer dummies. Number of observations: Brazil = 286, Canada = 174, France = 147, Germany = 124, India = 490, Italy = 154, Sweden = 43, UK = 235, and US = 307 .

Figure 2: Management practices within countries



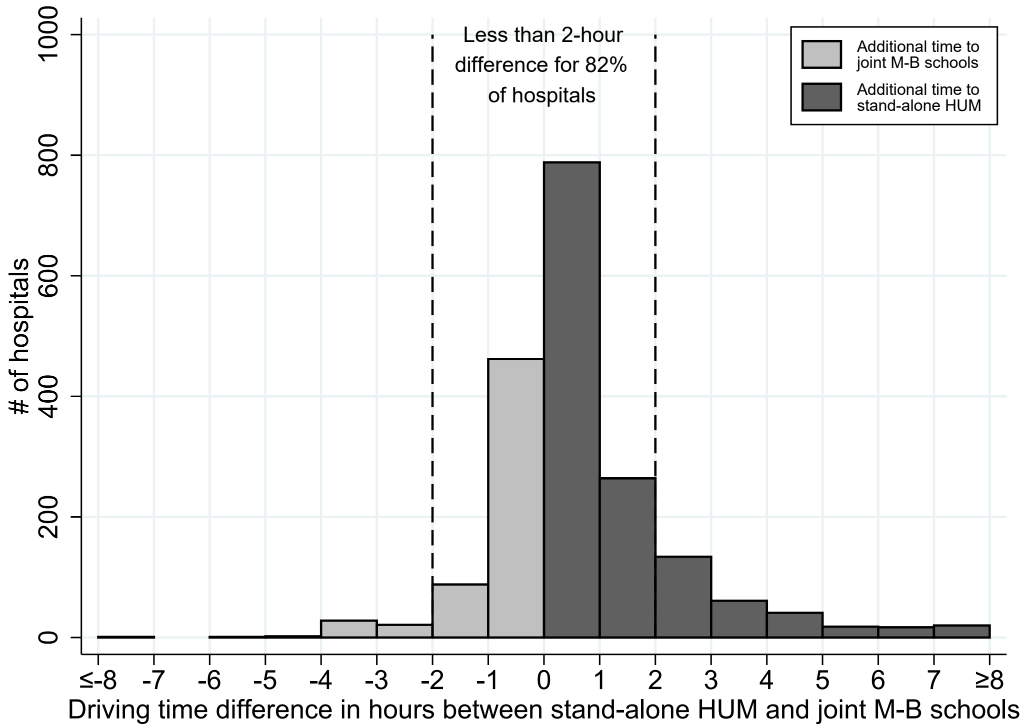
Notes: This figure shows the histogram of hospital management scores (the simple average over the 20 questions) within each country. The smoothed kernel of the distribution for the US is shown in each Panel. Number of observations: Brazil = 286, Canada = 174, France = 147, Germany = 124, India = 490, Italy = 154, Sweden = 43, UK = 235, and US = 307 .

Figure 3: Correlates of management practice score



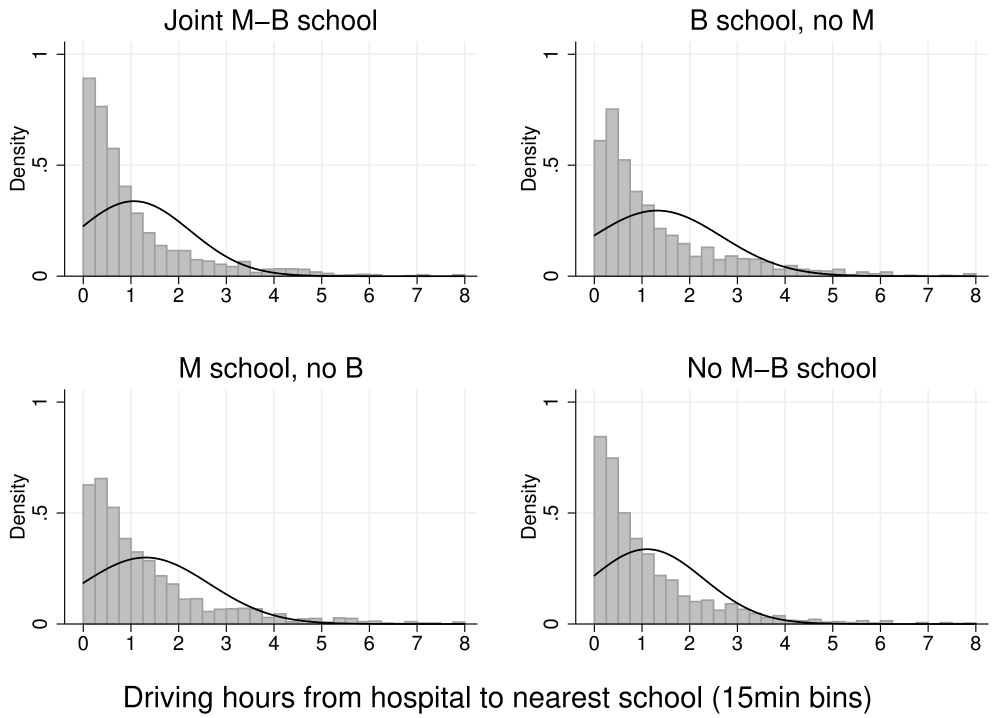
Notes: These are coefficients (and associated 95% confidence intervals) from OLS regressions where the dependent variable is the z-score of the hospital-level management practice score. The black diamond are the coefficients on the relevant variable when the only controls are country dummies and survey noise controls. The grey squares are the coefficients on the relevant variable when we also include the other covariates in the table. There are 1,960 observations underlying these regressions. .

Figure 4: Drive-times from hospital to Joint M-B (universities with both Medical and Business School) and stand-alone Humanities Schools



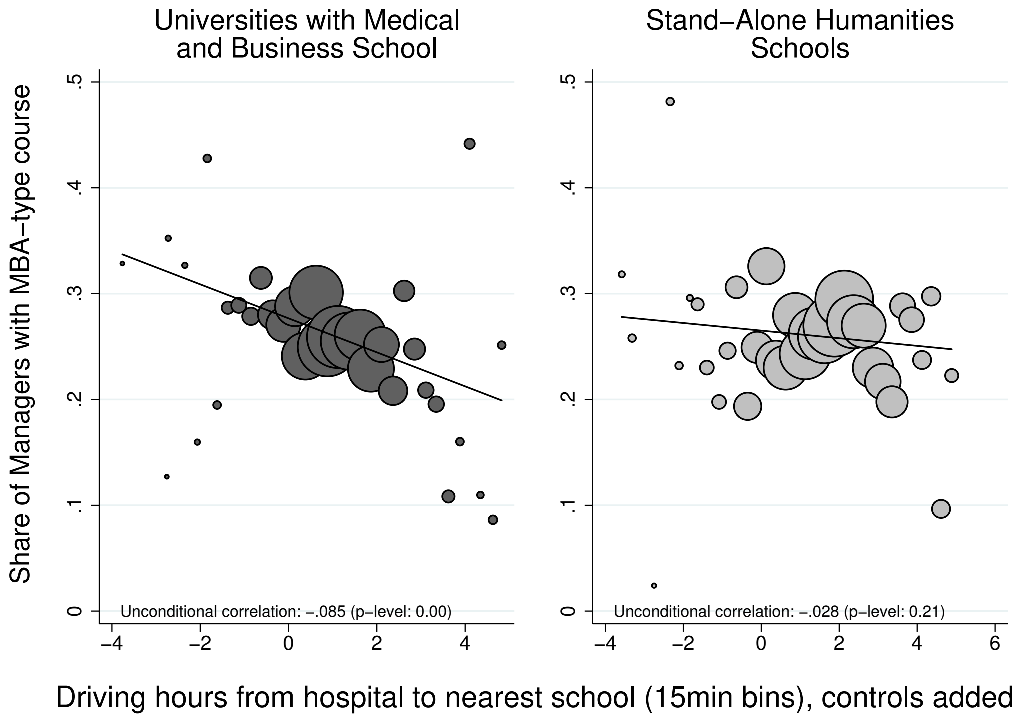
Notes: This figure shows the distribution of the differences between the drive-time from each hospital to the nearest university with both a Medical School and a Business School ("Joint M-B") and stand-alone Humanities' School ("HUM"). For example, a value of 2 indicates that there is an additional two hours' drive time from the nearest Joint M-B School to the nearest HUM School. A negative value indicates that the Humanities School is nearer. There are 1,960 observations and all observations greater than an absolute value of 8 are put in the bin labelled "≥ 8" or "≤ 8".

Figure 5: Drive-times between hospital and nearest school by school type



Notes: Each panel shows the distribution of drive times to the nearest type of school. **Joint M-B school** offers both business and medical courses. **B school, no M** offers business but no medical courses. **M school, no B** offers medical but no business courses. **No M-B school** offers neither types of courses. There are 1,960 observations. Figure excludes hospitals with driving hours longer than 8 hours for presentation purposes (Number excluded: Top-left panel = 13, Top-right panel = 20, Bottom-left panel = 25, Bottom-right panel = 17) .

Figure 6: Share of managers with MBA-type course and driving hours to nearest school



Notes: Each panel shows the mean share of managers with MBA type courses in a hospital (vertical axis) as a function of the drive time to the nearest type of school. Mean of share of managers with MBA-type courses and travel time in 15 minute bins. Controls include **noise controls** - interviewee seniority, tenure, department (Orthopeadics, Surgery, Cardiology, or Other), and type (Nurse, Doctor, or non-clinical Manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 21 interviewer dummies, and **geographic controls at the regional level** - log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. Excludes 31 hospitals with driving hours longer than 5 hours. Weighted markers represent the number of hospitals in each bin. Unconditional correlation with full-sample of 1,960 observations at the bottom or each panel.

Table 1: Descriptive statistics

	mean	median	sd	min	max
Hospital Characteristics					
AMI mortality rate (Z-Score)	0.02	-0.09	(1.01)	-2.2	4.8
Management Practice Score	2.42	2.40	(0.65)	1.0	4.3
Management Practice Score (Z-Score)	-0.02	-0.04	(1.01)	-2.2	3.0
Hospital beds	270.39	133.00	(365.40)	6.0	4000.0
Share of managers with MBA-type course	0.26	0.15	(0.29)	0.0	1.0
# of competitors: 0	0.14	0.00	(0.35)	0.0	1.0
# of competitors: 1 to 5	0.61	1.00	(0.49)	0.0	1.0
# of competitors: more than 5	0.24	0.00	(0.43)	0.0	1.0
Dummy public	0.51	1.00	(0.50)	0.0	1.0
Dummy private for profit	0.30	0.00	(0.46)	0.0	1.0
Dummy private not for profit	0.19	0.00	(0.39)	0.0	1.0
Distances to Universities					
Driving hrs, nearest joint M-B schools	1.16	0.65	(1.84)	0.0	41.8
Driving distance (km) to nearest joint M-B schools	80.28	36.59	(135.39)	0.0	2842.4
Driving hrs, nearest B school, no M	1.46	0.86	(2.16)	0.0	44.4
Driving hrs, nearest M school, no B	1.47	0.89	(2.19)	0.0	44.4
Driving hrs, nearest school, no M or B	1.24	0.71	(2.06)	0.0	44.4
Driving hrs, nearest stand-alone humanities school	1.86	1.14	(2.42)	0.0	44.4
Driving hrs, nearest university in general	0.62	0.32	(1.47)	0.0	41.8

Notes: These are descriptive statistics of the main variables used in the analysis. The maximum sample size is 1960. More descriptive statistics are in Table B1.

Table 2: AMI mortality rates are correlated with Management Practices

	(1) Z(AMI)	(2) Z(AMI)	(3) Z(AMI)	(4) Z(AMI)	(5) Z(AMI)
Z(Mgmt)	-0.188***	-0.202***	-0.184***	-0.190***	-0.184***
	(0.055)	(0.065)	(0.064)	(0.070)	(0.065)
Ln(Hospital beds)		-0.046	-0.044	-0.101	-0.056
		(0.081)	(0.083)	(0.090)	(0.082)
Dummy private for profit		-0.121	-0.082	0.004	-0.020
		(0.206)	(0.210)	(0.270)	(0.213)
Dummy private not for profit		-0.341**	-0.249*	-0.214	-0.194
		(0.147)	(0.139)	(0.143)	(0.143)
Omitted based is government owned					
Noise controls		Y	Y	Y	Y
Other hospital characteristics		Y	Y	Y	Y
Geographic controls - Regional level			Y	Y	
Geographic controls - Grid level					Y
Observations	478	478	478	478	478
No of clusters	397	397	397	397	397
Fixed effects (number)	country(5)	country(5)	country(5)	region(75)	country(5)
R-squared	0.02	0.16	0.20	0.34	0.19

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey). **Noise controls** include interviewee seniority, tenure, department (orthopeadics, surgery, Cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 21 interviewer dummies. **Hospital characteristics** include number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for “less than 5" (59% of responses), and 2 for “5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table 3: AMI mortality rates and managerial education

Dep. Var.: AMI mortality rate (z-score)	(1)	(2)	(3)	(4)	(5)
Ln(Driving hrs, nearest school)	0.035				
	(0.232)				
Ln(Driving hrs, nearest joint M-B schools)		0.390**	0.393**	0.358**	0.344**
		(0.169)	(0.160)	(0.163)	(0.154)
Ln(Driving hrs, nearest stand-alone HUM)		-0.079	-0.196		
		(0.154)	(0.173)		
Ln(Driving hrs, nearest school, no M, B, HUM)		0.073	0.072		
		(0.155)	(0.159)		
Ln(Driving hrs, nearest B school, no M)				0.066	
				(0.156)	
Ln(Driving hrs, nearest M school, no B)				0.075	
				(0.162)	
Ln(Driving hrs, nearest school, no M or B)				-0.180	
				(0.194)	
Geographic controls - Regional level			Y	Y	Y
Observations	478	478	478	478	478
No of clusters	397	397	397	397	397
Test of Equality: Joint M-B = HUM		0.08	0.03		
Test of Equality: Joint M-B = B, no M				0.20	
Test of Equality: Joint M-B = M, no B				0.28	
Test of Joint Sig.: HUM, no M-B-HUM		0.79	0.47		
Test of Joint Sig.: B, M, No B-M				0.72	
R-squared	0.15	0.16	0.20	0.20	0.20

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey). All columns include noise controls, hospital characteristics and country dummies. **Noise controls** include interviewee seniority, tenure, department (orthopeadics, surgery, cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 21 interviewer dummies. **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for “less than 5" (59% of responses), and 2 for “5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. Hospital latitude, hospital longitude and population density within 100km radius is also added.

Table 4: Hospital management score and managerial education

Dep. Var.: Management score (z-score)	(1)	(2)	(3)	(4)	(5)
Ln(Driving hrs, nearest school)	-0.139***				
	(0.045)				
Ln(Driving hrs, nearest joint M-B schools)		-0.125***	-0.112**	-0.107**	-0.145***
		(0.043)	(0.044)	(0.044)	(0.038)
Ln(Driving hrs, nearest stand-alone HUM)		-0.048	-0.019		
		(0.037)	(0.039)		
Ln(Driving hrs, nearest school, no M, B, HUM)		-0.065	-0.054		
		(0.041)	(0.042)		
Ln(Driving hrs, nearest B school, no M)				0.001	
				(0.041)	
Ln(Driving hrs, nearest M school, no B)				-0.034	
				(0.043)	
Ln(Driving hrs, nearest school, no M or B)				-0.053	
				(0.045)	
Geographic controls - Regional level			Y	Y	Y
Observations	1960	1960	1960	1960	1960
No of clusters	1869	1869	1869	1869	1869
Test of Equality: Joint M-B = HUM		0.24	0.16		
Test of Equality: Joint M-B = B, no M				0.09	
Test of Equality: Joint M-B = M, no B				0.25	
Test of Joint Sig.: HUM, no M-B-HUM		0.03	0.28		
Test of Joint Sig.: B, M, No B-M				0.39	
R-squared	0.60	0.61	0.61	0.61	0.61

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(Mgmt) refers to the hospital's z-score of management (the z-score of the average z-scores of the 20 management questions). All columns include noise controls, hospital characteristics and country dummies. **Noise controls** include interviewee seniority, tenure, department (orthopeadics, surgery, cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 21 interviewer dummies. **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for "less than 5" (59% of responses), and 2 for "5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. Hospital latitude, hospital longitude and population density within 100km radius is also added.

Table 5: Robustness checks

	(1) Z(AMI)	(2) Z(AMI)	(3) Z(AMI)	(4) Z(AMI)	(5) Z(AMI)	(6) Z(Mgmt)	(7) Z(Mgmt)
Ln(D-hrs to joint M-B)	0.344**	0.464**	0.404***	0.232*	0.287*	-0.142***	-0.167***
	(0.158)	(0.199)	(0.130)	(0.125)	(0.161)	(0.038)	(0.045)
Measures of University Quality							
Ln(Age of joint M-B)	0.030					0.043**	
	(0.091)					(0.020)	
Global QS Rank Dummy	0.450					0.237*	
	(0.498)					(0.127)	
Ln(Reversed Global QS Rank)	-0.050					-0.040*	
	(0.090)					(0.023)	
Offers Postgraduate Degree Dummy	0.203					0.003	
	(0.130)					(0.059)	
County Level Charateristics							
Employment in Manufacturing 2009				-0.440			
				(0.470)			
Employment in Healthcare 2009				-0.521			
				(0.515)			
% 25+ with bachelor's or higher 2009				-0.010**			
				(0.004)			
Log(Per capita Income) 2009				-0.608***			
				(0.177)			
Unemployment Rate 2009				-0.018			
				(0.014)			
Employment Growth 2000-2009				-1.443			
				(2.215)			
Noise controls	Y	Y				Y	Y
Hospital characteristics	Y	Y	Y	Y	Y	Y	Y
Geographic controls - Regional level	Y				Y	Y	
Geographic controls - Grid level		Y					Y
Observations	478	478	2011	2011	1178	1960	1960
No of clusters	397	397	732	732	213	1869	1869
Fixed effects	country	region	HRR		network	country	region
Sample	WMS	WMS	US AHA	US AHA	US AHA	WMS	WMS
R-squared	0.20	0.37	0.24	0.10	0.36	0.62	0.66

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey). Dependent variable Z(Mgmt) refers to the hospital's z-score of management (the z-score of the average z-scores of the 20 management questions) **Noise controls** include interviewee seniority, tenure, department (orthopeadics, surgery, cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 21 interviewer dummies. **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for "less than 5" (59% of responses), and 2 for "5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table A1: List of management practices

Operations Management

Topic	Description:	Example Questions:
Q1. Layout of Patient Flow	Measures how well the patient pathway is configured at the infrastructure level and whether staff proactively improve their own work-place organization	• Can you briefly describe the patient journey or flow for a typical episode? • How often do you run into problems with the current layout and pathway management?
Q2. Rationale for Introducing Standardisation/ Pathway Management	Measures the motivation and impetus behind changes to operations and what change story was communicated	• Can you take me through the rationale for making operational improvements to the management of the patient pathway? • What factors led to the adoption of these practices?
Q3. Standardisation and Protocols	Measures whether there are standardised procedures (e.g. integrated clinical pathways) that are applied and monitored systematically	• What tools and resources does the clinical staff employ to ensure that they have the correct patient and/or conduct the appropriate procedure? • How are managers able to monitor whether clinical staff are following established protocols?
Q4. Good Use of Human Resources	Measures whether staff are deployed to do what they are best qualified for, but nevertheless help out elsewhere when needed	• With respect to your staff, what happens when different hospital areas become busier than others? • What kind of procedures do you have in place to assist staff flow between areas?

Performance Monitoring

Topic	Description:	Example Questions:
Q5. Continuous Improvement	Measures how well the patient pathway is configured at the infrastructure level and whether staff proactively improve their own work-place organization	• How do problems typically get exposed and fixed? • Who within the hospital typically gets involved in changing or improving?
Q6. Performance Tracking	Measures whether hospital performance is tracked using meaningful metrics and with appropriate regularity	• What kind of performance or quality indicators would you use for performance tracking? • If I were to walk through your hospital wards and surgical rooms, could I tell how you were doing against your performance goals?
Q7. Performance Review	Measures whether hospital performance is reviewed with appropriate frequency and communicated to staff	• How do you review your main performance indicators? • What is a typical follow-up plan that results from review meetings?
Q8. Performance Dialogue	Measures the quality of hospital performance review conversations	• What type of feedback occurs in these meetings? • For a given problem, how do you generally identify the root cause?
Q9. Consequence Management	Measures whether differing levels of hospital performance (not personal but plan/ process based) lead to different consequence	• Let's say you've agreed to a follow-up plan at one of your meetings, what would happen if the plan weren't enacted? • How do you deal with repeated failures in a specific sub-specialty/cost area?

Notes: Detailed survey instrument available at www.worldmanagementsurvey.org

Table A1: List of management practices (con't)

Target Setting

Topic	Description:	Example Questions:
Q10. Target Balance	Measures whether targets cover a sufficiently broad set of metrics	• What types of targets are set for the hospital? What are the goals for your specialty? • Tell me about goals that are not set externally (e.g. by regulators)?
Q11. Target Interconnection	Measures whether targets are tied to hospital objectives and how well they cascade down the organisation	• What is the motivation behind these goals? • How are these goals cascaded down to the different staff groups or members?
Q12. Time Horizon of Targets	Measures whether hospital has a '3 horizons' approach to planning and targets	• What kind of time scale are you looking at with your targets? • Which goals receive the most emphasis?
Q13. Target Stretch	Measures whether targets are appropriately difficult to achieve	• How tough are your targets? How pushed are you by the targets? • How are your targets benchmarked?
Q14. Clarity and Comparability of Targets	Measures how easily understandable performance measures are and whether performance is openly communicated	• If I asked someone on your staff directly about individual targets, what would he or she tell me? • How do people know how their own performance compares to other people's performance? Is this published or posted in any way?

People Management

Topic	Description:	Example Questions:
Q15. Rewarding High Performers	Measures whether good performance is rewarded proportionately	• How does your appraisal/ review system work? Can you tell me about your most recent round? • How does your staff's pay relate to the results of this review?
Q16. Fixing Poor Performers	Measures whether the hospital is able to deal with underperformers	• If you had a nurse who could not do his/her job, what would you do? • How long is under-performance tolerated?
Q17. Promoting High Performers	Measures whether promotions and career progression are based on performance	• How do you identify and develop your star performers? What types of professional development opportunities are provided? • How do you make decisions regarding promotions within the unit/hospital?
Q18. Managing Talent	Measures what emphasis is put on talent management	• How do senior managers show that attracting talented individuals and developing their skills is a top priority? • Do senior staff members get any rewards for bringing in and keeping talented people in the hospital?
Q19. Retaining Talent	Measures whether the hospital will go out of its way to keep its top talent	• If you had a top performing nurse that wanted to leave, what would the hospital do? • Could you give me an example of a star performer being persuaded to stay?
Q20. Creating a Distinctive Employee Value Proposition	Measures how strong employee value proposition is to work in the individual hospital	• What makes it distinctive to work there, as opposed to other hospitals? • If I were a top nurse and you wanted to persuade me to work at your hospital, how would you do this?

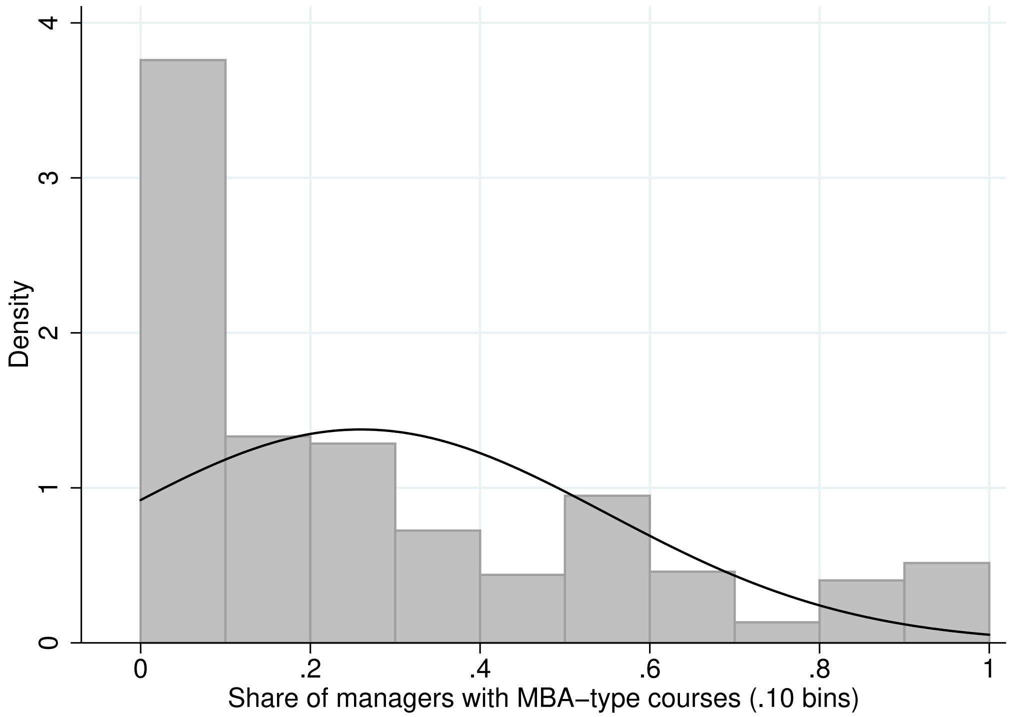
Notes: Detailed survey instrument available at www.worldmanagementsurvey.org

Table A2: Number of unique universities used in each country

	(1) Nearest Joint M-B Schools	(2) Nearest M, no B Schools	(3) Nearest B, no M Schools	(4) Nearest No M nor B Schools	(5) Nearest Stand-alone HUM Schools	(6) Nearest School
Brazil	121	130	198	225	148	245
Canada	57	57	47	53	51	80
France	40	59	23	64	28	92
Germany	47	60	32	66	53	94
India	123	115	57	92	45	210
Italy	22	20	41	29	12	64
Sweden	12	7	7	11	13	21
United Kingdom	64	27	29	26	21	100
United States	235	204	166	181	159	276
Total	721	679	600	747	530	1182

Notes: The table shows the number of unique universities used in each country (by type) for which we have identified to be nearest a hospital in our sample. **Joint M-B school** offers both business and medical courses. **M school, no B** offers medical but no business courses. **B school, no M** offers business but no medical courses. **No M-B school** offers neither types of courses. **Stand-alone HUM Schools** offers humanities types of courses. **Nearest school** refers to the nearest university offering any type of course.

Figure B1: Share of hospital managers with a MBA-type course



Notes: 1,960 observations.

Table B1: Descriptive statistics

	mean	median	sd	min	max	count
Hospital Geographic Characteristics						
Hospital latitude	33.96	38.86	(17.80)	-32.0	68.4	3996
Hospital longitude	-49.50	-77.83	(60.66)	-157.8	94.9	3996
Population density within 100km radius	572.05	207.87	(1164.92)	0.2	12667.0	3992
Hospital Geographic Characteristics - Regional level						
Ln(Income per capita), regional	10.11	10.52	(0.95)	6.6	11.9	3996
Years of education, regional	10.32	11.88	(3.04)	2.7	12.8	3979
Share of pop with high school degree, regional	0.45	0.54	(0.20)	0.0	0.7	3996
Share of pop with college degree, regional	0.21	0.22	(0.09)	0.0	0.5	3996
Population, regional	16.06	15.98	(1.15)	10.3	19.0	3996
Temperature, regional	13.73	12.45	(6.95)	-12.2	28.3	3996
Inverse distance to coast, regional	0.82	0.85	(0.14)	0.5	1.0	3996
Ln(Oil production per capita), regional	0.16	0.00	(0.36)	0.0	4.2	3996
Ln(# of ethnic groups), regional	0.82	0.69	(0.76)	0.0	3.0	3996
Hospital Geographic Characteristics - Grid level						
Gross prod. p.c, 2005 USD at market xrt, 2005	1.87	2.26	(1.52)	0.0	8.0	1957
Gross prod. p.c, 2005 USD at ppp xrt, 2005	2.11	2.52	(1.50)	0.0	9.4	1957
Distance to major navigable river (km)	879422.83	537973.40	(833327.76)	2821.7	4030517.0	1958
Distance to ice-free ocean (km)	314802.57	154694.60	(371156.10)	312.1	1804279.0	1958
Average precipitation	1101.90	1009.80	(422.77)	92.1	3495.1	1960
Average temperature	15.05	12.73	(8.16)	-9.2	28.9	1899
Elevation	401.15	280.70	(437.14)	1.8	4731.4	1960
Hospital Geographic Characteristics - US county level						
Employment in Manufacturing 2009	0.12	0.11	(0.06)	0.0	0.4	2036
Employment in Healthcare 2009	0.17	0.16	(0.05)	0.0	0.5	2036
Per Capita Income 2009 (USD)	26226.14	25241.00	(6674.74)	12699.0	60047.0	2023
Unemployment Rate 2009	7.36	7.15	(1.95)	1.8	19.9	2036
Employment Growth 2000-2009	0.00	0.00	(0.01)	-0.0	0.1	2036
% 25+ with bachelor's or higher 2009	26.08	25.90	(10.05)	7.3	69.5	2036
Joint M-B Characteristics - Quality proxies						
Global QS Rank Dummy	0.14	0.00	(0.35)	0.0	1.0	1960
Reversed Global QS Rank	279.84	262.00	(168.68)	1.0	601.0	274
Age of joint M-B	99.74	48.00	(146.31)	5.0	848.0	1876
Offers Postgraduate Degree Dummy	0.93	1.00	(0.26)	0.0	1.0	1960

Table B2: Within-country difference in location characteristics of the nearest joint M-B and stand-alone HUM schools to each hospital

	Stand-Alone Humanities Schools % relative to Mean	Universities with Medicine & Business Schools % relative to Mean	Diff in means	T Stat	Stand-Alone Humanities Schools N	Universities with Medicine & Business Schools N
Population density within 100km radius	-0.77	0.57	1.33	0.17	535	726
Latitude	0.21	-0.15	-0.36	-0.26	535	727
Longitude	-0.32	0.24	0.56	0.26	535	727
Gross product per capita-2005 USD at market exchange rates in 2005	1.48	-1.08	-2.56	-1.34	533	725
Gross product per capita-2005 USD at ppp exchange rates in 2005	1.48	-1.08	-2.56	-1.34	533	725
Distance to major navigable river (km)	2.22	-1.64	-3.87	-0.90	535	725
Distance to ice-free ocean (km)	-0.13	0.09	0.22	0.05	535	725
Average precipitation	-0.03	0.02	0.05	0.03	535	727
Average temperature	-4.23	3.11	7.34	0.30	535	727
Elevation	6.08	-4.48	-10.56	-1.81	535	727

Notes: This table shows differences in % relative to the country mean of grid-level location characteristics between a hospital's nearest University with Medical School and Business School and nearest stand-alone Humanities school. In total, 530 stand-alone Humanities schools and 721 universities with Medical and Business School have been used in the analysis.

Table B3: Characteristics of Universities with Joint Medical-Business Courses

	(1) Joint M-B	(2) Joint M-B	(3) Joint M-B	(4) Joint M-B	(5) Joint M-B
Ln(School Age)	0.037***				0.019*
	(0.011)				(0.011)
Global QS Rank Dummy		0.193***	0.371***		0.344**
		(0.041)	(0.138)		(0.137)
Ln(Reversed Global QS Rank)			-0.034		-0.034
			(0.025)		(0.025)
Offers Postgraduate Degree Dummy				0.123***	0.108***
				(0.021)	(0.021)
Observations	2709	2709	2709	2709	2709
No of clusters	2709	2709	2709	2709	2709
Fixed effects	country	country	country	country	country
R-squared	0.03	0.04	0.04	0.04	0.05

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors clustered by hospital network in parentheses. Dependent variable **Joint M-B** equals to 1 if University with Medical School and Business School. **Age of joint M-B** refers to the age of the university hosting both business and medical schools in the year the hospital survey was conducted in each country. **Global QS Rank Dummy** equals to 1 if the university hosting both business and medical schools was mentioned in the Quacquarelli Symonds World University Ranking in 2011.

Table B4: Share of MBA-type education and distance to schools

	(1) Ln(MBA)	(2) Ln(MBA)	(3) Ln(MBA)	(4) Ln(MBA)	(5) Ln(MBA)
Ln(Driving hrs, nearest school)	-0.023				
	(0.017)				
Ln(Driving hrs, nearest joint M-B schools)		-0.033**	-0.028*	-0.030**	-0.023*
		(0.014)	(0.014)	(0.015)	(0.013)
Ln(Driving hrs, nearest school, no M, B, HUM)		-0.010	-0.002		
		(0.012)	(0.013)		
Ln(Driving hrs, nearest stand-alone HUM)		0.002	0.014		
		(0.011)	(0.011)		
Ln(Driving hrs, nearest B school, no M)				0.016	
				(0.013)	
Ln(Driving hrs, nearest M school, no B)				-0.019	
				(0.012)	
Ln(Driving hrs, nearest school, no M or B)				0.016	
				(0.013)	
Geographic controls - Regional level			Y	Y	Y
Observations	1960	1960	1960	1960	1960
No of clusters	1869	1869	1869	1869	1869
Test of Equality: Joint M-B = HUM		0.08	0.04		
Test of Equality: Joint M-B = B, no M				0.03	
Test of Equality: Joint M-B = M, no B				0.62	
Test of Joint Sig.: HUM, no M-B-HUM		0.71	0.48		
Test of Joint Sig.: B, M, No B-M				0.19	
R-squared	0.27	0.28	0.29	0.29	0.28

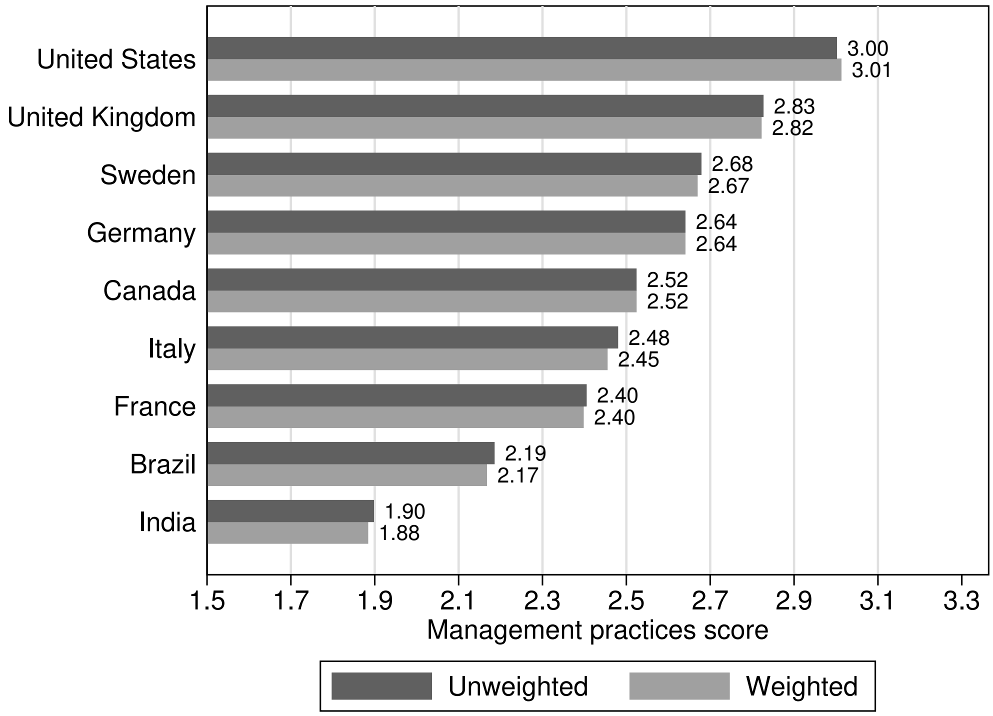
Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. All columns estimated by OLS. Standard errors clustered by hospital network in parentheses. Dependent variable Ln(MBA) refers to the log of the share of hospital managers with a MBA-type course. All columns include noise controls, hospital characteristics and country dummies. **Noise controls** include interviewee seniority, tenure, department (orthopeadics, surgery, cardiology, or other), and type (nurse, doctor, or non-clinical manager), year and duration of the interview, an indicator of the reliability of the information as coded by the interviewer, and 21 interviewer dummies. **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for “less than 5" (59% of responses), and 2 for “5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Table B5: The effects of MBA-trained managers on hospital management

2nd Stage-Top/1st Stage-Bottom	Main results						Placebo			Robustness
	(1) Z(AMI)	(2) Z(AMI)	(3) Z(AMI)	(4) Z(Mgmt)	(5) Z(Mgmt)	(6) Z(Mgmt)	(7) Z(Mgmt)	(8) Z(Mgmt)	(9) Z(Mgmt)	(10) Z(Mgmt)
Endogenous Variable:										
Ln(% of managers with MBA-type course)	-6.082***	-8.052*	-13.833	5.050***	5.090***	6.346*	4.548**	3.775*	-17.076	4.707**
	(2.355)	(4.759)	(14.491)	(1.020)	(1.827)	(3.600)	(2.313)	(1.984)	(42.620)	(1.957)
Ln(Driving hrs, nearest joint M-B schools)	-0.074***	-0.047*	-0.025	-0.062***	-0.037***	-0.023*	-0.029**	-0.029**		-0.035**
	(0.026)	(0.028)	(0.029)	(0.012)	(0.013)	(0.013)	(0.014)	(0.014)		(0.014)
Ln(Driving hrs, nearest stand-alone HUM)							0.013	0.013	0.004	
							(0.011)	(0.011)	(0.011)	
Noise controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hospital characteristics		Y	Y		Y	Y	Y	Y	Y	Y
Geographic controls - Regional level			Y			Y	Y	Y	Y	
Geographic controls - Grid level										Y
Observations	478	478	478	1960	1960	1960	1960	1960	1960	1960
No of clusters	397	397	397	1869	1869	1869	1869	1869	1869	1869
Fixed effects (number)	country(5)	country(5)	country(5)	country(9)	country(9)	country(9)	country(9)	country(9)	country(9)	region(182)
First stage F-stat	0.01	0.09	0.40	0.00	0.00	0.08	0.04	0.10	0.68	0.01
Placebo added as							control	instrument	instrument	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by hospital network in parentheses. Dependent variable Z(AMI) refers to a pooled measure of country-specific acute myocardial infarction mortality rates (measures are standardized by country and year of survey). Dependent variable Z(Mgmt) refers to the hospital's z-score of management (the z-score of the average z-scores of the 20 management questions). **Noise controls** are 21 interviewer dummies, the seniority and tenure of the manager who responded, the duration of the interview, and an indicator of the reliability of the information as coded by the interviewer, interviewee type (nurse, doctor or non clinical manager). **Hospital characteristics** include log of the number of hospital beds, dummies for private for profit and non for profit, and number of competitors constructed from the response to the survey question on number of competitors, and is coded as zero for none (16% of responses), 1 for "less than 5" (59% of responses), and 2 for "5 or more" (25% of responses). **Geographic controls - Regional level** include log of income per capita, years of education, share of population with high school degree, share of population with college degree, population, temperature, inverse distance to coast, log of oil production per capita, log of number of ethnic groups. **Geographic controls - Grid level** include log of gross product per capita, 2005 USD at market exchange rates, log of gross product per capita, 2005 USD at pp exchange rates, 2005, distance to major navigable river, distance to ice-free ocean, average precipitation, average temperature, and elevation. Whenever one of these two sets of geographic controls are added, hospital latitude, hospital longitude and population density within 100km radius is also added.

Figure C1: Management practices across countries corrected for sampling response rates



Notes: Average management score using sample weights constructed from the sample selection model in Column 1 of Table C4. The number of observations in each country is as follows: Brazil = 286, Canada = 174, France = 147, Germany = 124, India = 490, Italy= 154, Sweden = 43, United Kingdom = 235, and United States = 307. .

Table C1: Sampling frame sources

Country	Source
Brazil	National Registry of Health Facilities (*Cadastro nacional de estabelecimentos de saúde*).
Canada	Scott's Directories (https://secure.scottsdirectories.com/)
India	The hospital sampling frame was constructed using several online sources. • National Accreditation Board for Hospitals and Healthcare Providers (NABH) (http://www.nabh.co/main/hospitals/accredited.asp) • Medicards.in (https://www.medicards.in/) • Hospital Khoj (http://www.hospitalkhoj.com/general.htm) • Cite HR (http://www.citehr.com/110771-all-india-hospitals-adresses-contact-nos.html) • Hospitals in India (http://www.hospitalsinindia.org/) The process used to construct the sampling frame was the following. First, we extracted hospital names, contact info and all other info available from these five sources. This yielded a total of 15,431 entries. Second, we appended all lists and remove duplicate entries and ineligible hospitals using (i) exact match with hospital name and (ii) exact match with state and city, (iii) and dropping hospitals containing the following words in the name (acupuncture, advanced glaucoma, plastic, ENT research foundation, neuro, mental, maternity, maternity, cosmetic, child care, ENT, communicable diseases, bone and joint, day care, clinic of integrated medicine, diabetes, integrated organ transplant, reproductive, poly clinic, polyclinic, community hospital, surgical clinic, physiotheraphy, nursing, digestive, diabetic, leprosy, scanning, laproscopic, micro surgery). This yielded a total of 7,191 entries. This number is in agreement with statistics from the Ministry of Health reporting that 7,008 rural and urban hospitals exist in India (http://cbhidghs.nic.in/hia2005/8.01.htm)
Italy	Ministry of Health (*Ministero della Sanita'*)
France	Federation Hospitaliere de France
Germany	Hospital directory acquired separately for each state
Sweden	Sveriges Kommuner och Landsting (*Swedish Association of Local Authorities and Regions*)
US	American Hospital Association
UK	National Health Service and Private Healthcare UK

Table C2: Sampling frame characteristics

	BR	CA	DE	FR	IN	IT	SE	UK	US
Healthcare facilities (N)	5861	902	1559	3926	3831	1572	153	1219	6388
Eligible hospitals in random sample (N)	591	527	553	292	1309	376	85	483	1526
Public hospitals in eligible random sample (%)	39	99		86				61	28
Beds in eligible random sample (median)		45	238	730		269	197	195	110

Notes: BR=Brazil, CA=Canada, DE=Germany, FR=France, IN=India, IT=Italy, SE=Sweden, UK=United Kingdom, US=United States. Sampling frame is the total number of hospitals eligible for the survey drawn from a random sample of hospitals from the universe of healthcare facilities in the country. Public Hospitals refers to the percentage of hospitals which are funded and managed by government authorities. This information is not available for Germany, India, Italy, and Sweden. Beds is the median number of beds in the hospital. This information is not available for Brazil and India.

Table C3: Survey response rates

	All Hospitals in Random Sample								
	BR	CA	DE	FR	IN	IT	SE	UK	US
Interviews completed (%)	10.73	24.61	19.4	44.96	12.87	30.18	41.18	20.18	16.7
Scheduling in progress (%)	9.58	45.4	44.48	31.7	14.36	34.36	21.32	30.6	57.78
Interviews refused (%)	1.63	4.53	18.66	7.49	6.94	3.82	0	2.77	4.18
Hospital not eligible (%)	78.06	25.46	17.46	15.85	65.83	31.64	37.5	46.45	21.34
Sample, all (N)	2694	707	670	347	3831	550	136	902	1940
	Eligible Hospitals in Random Sample								
	BR	CA	DE	FR	IN	IT	SE	UK	US
Interviews completed (%)	48.9	33.02	23.51	53.42	37.66	44.15	65.88	37.68	21.23
Scheduling in progress (%)	43.65	60.91	53.89	37.67	42.02	50.27	34.12	57.14	73.46
Interviews refused (%)	7.45	6.07	22.6	8.9	20.32	5.59	0	5.18	5.31
Sample, eligible (N)	591	527	553	292	1309	376	85	483	1526
Interviews completed (N)	289	174	130	156	493	166	56	182	324

Notes: BR=Brazil, CA=Canada, DE=Germany, FR=France, IN=India, IT=Italy, SE=Sweden, UK=United Kingdom, US=United States. 1) **Interviews completed** reports all the hospitals contacted for which a management interview was completed. 2) **Scheduling in progress** reports all the hospitals contacted with no interview run or manager refusing to be interviewed. 3) **Interviews refused** reports all hospitals contacted in which the manager refused to take part in the interview. 4) **No longer eligible** reports all hospitals contacted which do not have an Orthopeadics or Cardiology Department, do not provide acute care, and do not have overnight beds. It also included organizations out-of business or for which no phone number was found. **Sample, all** is the total number of hospitals that were randomly selected and contacted from the complete sampling frame. **Sample, eligible** is the total number of hospitals that were randomly selected, contacted from the complete sampling frame, and eligible for the survey.

Table C4: Selection analysis

	(1) Interview	(2) Interview	(3) Interview	(4) Interview	(5) Interview	(6) Interview	(7) Interview	(8) Interview	(9) Interview	(10) Interview
Ln(Income per capita)	-0.022	0.410	0.318	-1.000	-1.715	-0.134	0.697	1.361	2.482	-0.813*
	(0.090)	(0.589)	(0.611)	(0.714)	(1.406)	(0.197)	(0.627)	(2.589)	(1.600)	(0.448)
Population	0.035	0.066	-0.026	0.378***	0.468	-0.171**	0.170	-2.187	-0.420	0.100*
	(0.023)	(0.073)	(0.101)	(0.144)	(0.306)	(0.084)	(0.169)	(5.514)	(0.302)	(0.055)
Years of education	-0.042	-0.006	0.062	0.121	0.363	0.080	0.039	5.131	-0.391	0.185
	(0.048)	(0.365)	(0.407)	(0.232)	(0.347)	(0.119)	(1.559)	(12.106)	(0.424)	(0.212)
Share of pop with high school degree	0.239	-4.474	-3.390	-6.654	0.725	-7.106**	-5.292	102.795	20.042*	0.031
	(0.733)	(9.182)	(8.408)	(4.444)	(3.684)	(2.855)	(20.402)	(124.026)	(10.569)	(1.640)
Temperature	-0.025***	-0.050	-0.003	-0.280	0.140	-0.047	-0.166	1.274	0.074	-0.025*
	(0.008)	(0.054)	(0.041)	(0.224)	(0.108)	(0.036)	(0.104)	(2.855)	(0.178)	(0.013)
Inverse distance to coast	-0.287*	-0.396	1.315	0.849	-0.788	-1.152***	13.259**	33.055	-1.692	0.029
	(0.166)	(0.908)	(0.992)	(1.513)	(1.940)	(0.422)	(5.825)	(22.453)	(7.519)	(0.318)
Ln(# of ethnic groups)	0.012	0.008	0.106	-0.185	0.056	0.203*	0.007	2.130	0.296	0.033
	(0.033)	(0.107)	(0.237)	(0.166)	(0.240)	(0.120)	(0.227)	(4.048)	(0.377)	(0.062)
Public Hospital		0.059	-0.654		0.186				0.054	0.789***
		(0.114)	(0.473)		(0.220)				(0.208)	(0.082)
Ln(# of Hospital Beds)			0.032	0.185***			0.133*	-0.019	0.080	-0.027
			(0.052)	(0.069)			(0.070)	(0.148)	(0.068)	(0.036)
Observations	5742	591	526	553	292	1288	375	85	448	1434
Sample	ALL	BR	CA	DE	FR	IN	IT	SW	UK	US

Notes: Estimate by Probit ML (marginal effects reported with robust standard errors in parentheses). The dependent variable **Interview** equals to 1 if hospital has been interviewed. BR=Brazil, CA=Canada, DE=Germany, FR=France, IN=India, IT=Italy, SE=Sweden, UK=United Kingdom, US=United States.

ONLINE APPENDICES (NOT INTENDED FOR PUBLICATION)

APPENDIX A: DATA

A1. Management Survey Data

Table A1 lists the 20 management practices questions asked during the survey.

A2. Hospital-Level Performance Data

We use hospital performance data for five countries surveyed, for which data was publicly available. Below is a description of our hospital performance dataset for each country.

Brazil: We used the rate for myocardial infarction specified as acute or with a stated duration of 4 weeks (28 days) or less from onset (ICD-10, I21) for years 2012 and 2013. We create a simple risk-adjusted measure by taking the unweighted average across rates for each rage-gender-age cell for each hospital. The raw data was extracted from Datasus Tabnet (http://tabnet.datasus.gov.br).

Canada: We take the average of the risk-adjusted rate for acute myocardial infarction mortality for the years 2004-2005, 2005-2006 and 2006-2007 for the provinces British Columbia and Ontario. The data was extracted from hospital reports provided by the Fraser Institute (www.fraserinstitute.org).

Sweden: We use 28-day case fatality rate from myocardial infarction for hospitalized patients for the years of 2004 to 2006 computed and published by the Swedish Association of Local Authorities and Regions (SALAR) and the Swedish National Board of Health and Welfare (NBHW) in the report "Quality and Efficiency in Swedish Health Care – Regional Comparisons 2008".

United States: We use the 30-day death (mortality) rates from heart attack from July 2005 to June 2008 (2009 for the specifications using census data in Table 5) computed and published by Hospital Compare.

United Kingdom: We use 30-day risk adjusted AMI mortality data purchased from “Dr Foster” relative to 2006 (matched with the 2006 survey wave) and 2009 (matched with the 2009 survey wave).

A3. University Data

The University data comes from the World Higher Education Database (WHED) which has the location, foundation date and list of “divisions” (subjects) of all research universities in our chosen countries (see Feng, 2015; Valero and Van Reenen, 2016). Divisions are classified into Business (Management, Administration, Entrepreneurship, Marketing, Advertising courses), Medical (Clinical courses), and Humanities (Arts, Language, Religion courses). Table A2 shows the number of unique schools in each country used in this analysis.

A4. Distance Information

We geo-code the location of hospitals and universities using addresses available, cross referencing four sources of coordinates (Geopostcodes datasets purchased, Google geo-coding of address, geo-coding of institution name and manual searches on search engines) and converging to a final dataset. We compute travel times using Google API (travel times are not a function of time of day, that it, running the Google distance API at 11pm on a Sunday vs 9am on a Monday yields the same result). Computation of distance is restricted to hospitals and universities in the same county.

A5. Location Information

The source data on population density comes from CIESIN and is presented as average density within population grids identified by the coordinates of the grid’s centroid. Population density is computed using ArGIS. We spatially join hospital coordinates with centroid coordinates and (1) take the population density of the closest centroid (2) compute the average population density of all centroids within 100km (3) compute the inverse distance weighted population density of all centroids within 100km. Results are robust to using any one of these three measures. Computation of distance is restricted to hospitals and universities in the same county.

APPENDIX B: ADDITIONAL RESULTS

Table B1 presents descriptive statistics on the range of regional- and grid-level location characteristics used in the analysis.

Table B2 presents the within-country difference in means of grid-level location characteristics of the nearest joint M-B and stand-alone HUM schools to each hospital in our dataset.

Table B3 explores whether schools offering medical and business training are of better quality relative to other schools as measured by school age, listed in QSWUR ranking, and offering postgraduate degrees.

Table B4 explores the relationship between the share of managers with a MBA-type course and distance to joint M-B school.

In Table B5 we bring the results of Tables 2, 3 and 4 together. Columns (1) through (3) use AMI mortality rates as the dependent variable and regress this on the share of managers with an MBA type degree. We instrument share of MBA with the distance to a joint M-B school embodying the idea that proximity increases the managerial skill supply which in turn benefits hospital performance. If the only way that university proximity matters is through this school supply this should identify the causal impact of managerial education on hospital performance. The negative and significant effect in column (1) is consistent with a large causal effect. However, an important caveat is that the exclusion restriction may not be valid. For example, if proximity enabled a hospital to receive other beneficial inputs (executive education and consultancy that are not reflected in MBA share) this would violate the exclusion restriction. Columns (4) through (6) of Table 6 repeat the specifications of the first three columns, but use management practices as the dependent variable instead of AMI death rates. In column (7) and (8) we add distance to stand-alone HUM schools as a control and as an instrument, respectively, while maintaining distance to joint M-B as an instrument. There is a positive and significant coefficient on MBA share across all five columns. In column (9) we perform a placebo test by removing distance to joint M-B schools and using solely distance to stand-alone HUM schools as an instrument. As expected, the MBA share coefficient is no longer significant and turns negative. Another caveat to these results is that the instruments are not strong. The F-statistics shown in the lower rows are about 8 in the simplest specifications, but are much lower when we control for other covariates, especially geographical controls in columns (3) and (6). The second stage coefficients also become much more imprecise in these columns which is consistent with the weak instruments problem.

APPENDIX C: SAMPLING FRAME

C1. The Sampling Frame and Eligibility to Participate in the Management Survey

In every country the sampling frame for the management survey included all hospitals that (i) have an Orthopaedics or Cardiology Department, (ii) provide acute care, (iii) have overnight beds. The source of this sampling frame by country is shown in Table C1. Interviewers were each given a randomly selected list of hospitals from the sampling frame. This should therefore be representative of the population of hospitals in the country. At hospitals, we either interviewed the director of nursing, medical superintendent/nurse manager/administrator of specialty, that is, the clinical service lead at the top of the speciality who is still involved in its management on a daily basis. The clinical service leads also had to be in the post for at least one year at the time of the interview.

Table C2 shows the number of healthcare facilities in each country, the number of eligible hospitals randomly drawn the sampling frame, and hospital characteristics from these eligible hospitals. For the countries where information is available, the sample in Canada, France and the UK present the largest percentage of hospitals which are funded and managed by government authorities (all above 60% with Canada reaching 99%), while the samples in Brazil and the US have the lowest percentage (39% and 28%, respectively).

The median hospital size in the sample in France as measured by the number of hospital beds is by far the largest (730) while the median hospital in the sample in Italy, Germany, the UK and Sweden are of similar size (between 195 and 269 beds). The US and Canada samples present the smallest sized hospitals.

C2. The Survey Response Rates
Table C3 shows the survey response rates by country. The top table represents all hospitals in the randomly selected list of hospitals given to the interviewers as described above. The bottom table represents all hospitals eligible for the interview. The eligibility criteria were confirmed by the interviewer during the process of contacting and scheduling the interview. As the type of healthcare facilities included in the lists sourced in each country varied substantially, interviewers spent significant time on the phone screening out ineligible hospitals. For example, interviewers identified 78% of hospitals to be ineligible for the survey in Brazil while in France this number is down to 16%. This is one of the main reasons for a lower average of hospital interviews conducted per day in comparison to the average for our manufacturing interviews (2.8 per day).

In terms of interviews completed, we managed to obtain a response rate ranging from 66%, 53% and 49% of eligible hospitals in Sweden, Germany, and Brazil, to 21% of eligible hospitals in the US. In contrast, the explicit refusal rate was generally low across all countries surveyed, ranging from no refusals in hospitals in Sweden to 22% of all eligible hospitals in Germany. The high response rate in general was due to greater persistence in following up non-respondents in order to meet the target numbers we were aiming for and to the fact that most hospital managers interviewed in these countries responded with a scheduled time and date soon after the first or second contact with the interviewer.

"Scheduling in progress" indicates hospitals which have been contacted by an interviewer and which have not refused to be interviewed (for example they may schedule an interview but cancel or postpone it or simply take more time to respond). The high share of "scheduling in progress" schools was due to the need for interviewers to keep a stock of between 100 to 300 hospitals to cycle though when trying to arrange interviews. Since interviewers only ran an average of 1.1 interviews a day the majority of their time was spent trying to contact hospitals managers to schedule future interviews.

The ratio of successful interviews to rejections (ignoring "scheduling in progress") is above 1 in every country. Hence, managers typically agreed to the survey proposition when interviewers were able to connect with them.

C3. Selection Analysis
Panel A of Table C4 analyses the probability of being interviewed. Within each country, we compare the responding hospitals with those eligible hospitals in the sampling frame - including "interviews refused" and "scheduling in progress" but removing "hospital not eligible" for the survey - against three types of selection bias: location characteristics (income per capita, population size, population average years of education, share of population with a high school degree, share of population with a college degree, average temperature, inverse distance to coast, oil production per capital), size (number of hospital beds), ownership (whether the hospital is owned and managed by government authorities).

Looking at the overall pattern of results, there are very few significant coefficients. The results from the pooled sample show that only the coefficients for temperature and inverse distance to coast are significant (this is driven by a few countries as opposed to being an overall trend). One noticeable exception is India where the results show that hospitals with certain location characteristics are more likely to respond (hospitals in areas less populated, lower share of population with high school, farther away to the coast, and with a larger number of ethnic groups). Information on whether the hospital is owned and managed by government authorities and the number of hospital beds is not available for all countries, nonetheless we check for any potential selection bias in the countries for which we have this information. The results show that public hospitals are more likely to be interviewed, although this is only significant in the US, and larger hospitals are more likely to be interviewed in Germany (significant at the 1% level) and in Italy (significant at the 10% level).

To address selection concerns, we used the pooled regression in Column 1 of Table C4 (where data are available for all countries) to construct sampling weights. We then plot our cross-country ranking using the estimated weights. We found that the rankings across countries for the unweighted scores in Figure 1 were very robust when using this alternative sample weighting scheme. Figure C1 below gives the equivalent of Figure 1 using the weights from Table C4.

APPENDIX D: EXAMPLES OF HOSPITAL MANAGEMENT PRACTICE

United States

A typical US hospital has a set layout of patient flow which has been thought through and streamlined to be as efficient as possible. If the hospital is spread over a set of floors, it has a dedicated patient elevator to avoid delays in transporting patients. Diagnostic rooms, operation theatres and pharmacies are fairly close to each other by design, though there is not much discussion to improve this pathway anymore. There is a certain level of standardization of clinical processes across the hospital, with a set of "care models" or checklists which are to be followed by physicians and nurses. The compliance with these is checked infrequently and through an audit once per quarter or year.

For improvements to the hospital, suggestions are only followed up on if someone mentions it. The hospital has some informal processes to collect staff feedback via suggestion boxes or an open-door policy for managers. With respect to their staff, a hospital has fixed sets of staff, which are competent in their specific areas. Staff are not found performing duties for which they are over-qualified for. Ward nurses are flexible, but there is no cross-ward movement.

In terms of key performance indicators, a hospital mainly tracks patient satisfaction reports and some other government indicators. The directors review the reports monthly, and clinical leaders are responsible for sharing this data with lower level staff. While there is a process, there are no proactive visual cues in the wards or hallways. For reviewing this data, the managers have a monthly meeting that all staff, care technicians and administration staff are involved. Metrics regarding different aspects of the hospital management are reviewed, and while there is some follow up plans drawn up, no clear responsible person, expectations or deadlines are assigned.

For overall targets, there is broad range of targets that include several different aspects, from clinical to operational and financial. But these are seen as an overall mission rather than day-to-day goals. As a consequence, targets are not well understood and shared at the lower level of the hospital. Generally, they are set by the regional government and are not coherently shared with the various levels within the hospital. They usually have short-term and long-term components, with at least a 3-year plan that is loosely linked to the short-term targets. These targets are challenging but not pushy for most departments. Hospital meets 70-80% of its targets. Not all departments have the same difficulty of targets (for instance, surgery gets easier targets than cardiology), and while nurses are held accountable for budget targets, doctors are not held responsible.

There are yearly appraisal conversations with staff. These try to detect development necessities or possibilities for the staff, but there is no bonus system. Rewards are sometimes given in form of flowers or a voucher to a movie theatre. For poor performers, this evaluation system triggers a training system when under-performance is identified. If the person does not get “fixed” after training, a disciplinary process starts. However, the process can last years and, if the person is eventually fired, the likelihood that he or she will be reinstated in the post is very high because of pressures from the unions and the infinite bureaucratic procedures.

India

The typical hospital in India is spread over a set of floors, with diagnostic centers and the emergency room on the ground floor, the Operation Theatres and post-op rooms on the first floor. General wards would usually be in the floors above the OT, though there are usually a set of "deluxe" rooms in the same floor of the OT for higher-paying patients. There is one elevator, which is shared, and a ramp in case the elevator fails. There is a general push for standardization and a willingness to develop protocols to seek accreditation, though this is not fully implemented yet. There is usually a basic lab certification, and an ISO certificate for very basic processes (i.e. are the basic procedures and infrastructure to carry out the operations of the hospital?). Checklists are not used. There is a patient history file, but processes are not thoroughly documented. Monitoring of these processes are done by ad-hoc peer-checking and not through a set procedure.

Nurses are trained in a particular department and then rotated every six months. They are cross-trained, and any staff movement is coordinated by the matron. There is no documentation of skills, and only the matron would know who could be allocated where based on her experience.

Performance is generally not tracked, apart from patient satisfaction surveys. The average hospital will sometimes track infection rates and occupancy rates, but not in a systematic manner and nothing beyond this. Whatever is tracked, is normally done on a monthly basis. Managers have monthly meetings to review the state of the hospital, but there is not much data to review. Conversations revolve around issues that happened in the month, any problems that arose, and they record the minutes of the meeting which are shared only with the attendees. The heads of department are then expected to share the information with other staff, though this is not checked or followed up on.

Overall hospital targets are very vague and not quantitative, such as "we would like to improve our specialty" or "we aim to get more equipment." There are no financial or operational targets. Since there are no targets, there is not a general concept of short-term or long-term targets, interconnection or difficulty of targets.

There is a yearly appraisal system, mostly done by observation of work, and it is not well defined in terms of quantifiable parameters. For instance, there is not a specific attendance rate that is expected or measured. The evaluation is based on more qualitative perceptions, such as "does the person do their job well" (without a clear measure of what "well" means). There is an increment to salary if the appraisal goes "well," but bonuses are not based on performance. Promotions are based on tenure first, and then, among the set of most senior people, performance is taken into account. There are no opportunities for professional development beyond sending people to courses and conferences, which are not frequent (once per year at most). Poor performers are dealt with through a 3-step process of verbal warning, written warning followed by termination. This usually takes at most one month, and if the problem is not fixed their employment is terminated.