QATAR UNIVERSITY

COLLEGE OF HEALTH SCIENCES

ADULT HOSPITAL INPATIENT EXPERIENCE IN QATAR AND ASSOCIATED FACTORS: A CROSS-SECTIONAL STUDY

BY

NOORA ABDULLA AWAD SALEM

A Thesis submitted to the

College of Health Sciences

in Partial Fulfillment of the Requirements for the Degree of

Master of Public Health

June 2020

COMMITTEE PAGE

The members of the Committee approve the Thesis of
Noora Abdulla Awad Salem defended on 11/05/2020.

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Dr. Mujahed M. Shraim
Thesis/Dissertation Supervisor

Approved:

_____

Hanan Abdul Rahim, Dean, College of Health Science

ABSTRACT

SALEM, NOORA, ABDULLA AWAD., Master of Public Health:June: [2020], Department of Public Health

Title: Adult Hospital Inpatient Experience in Qatar And Associated Factors: A Cross-Sectional Study

Supervisor of Thesis: Mujahed, M, Shraim.

Background: Evaluation of hospital inpatient experience (HIE) is an important measure used by healthcare organizations to evaluate the effectiveness of their current processes and understand how responsive and respectful the healthcare providers are in addressing patient needs and preferences.

Aim: The aim of this thesis was to estimate the overall HIE in the State of Qatar and identify related factors using Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey from April 2017 to 2019, inclusive.

Methods: This was a cross-sectional study using secondary HCAHPS data from the Ministry of Public Health from 12 public and private hospitals in Qatar. Multivariable multilevel linear regression methods were used to analyse the data.

Results: This study included 14,367 survey participants. The national average for overall hospital rating was 88.9%. The trend for the average overall hospital rating increased from 2017 to 2019 (87.7% to 88.6%; F=7.3, p=0.007). The national average for willingness to recommend the hospital to family and friends was 89.0%. Also, recommendation of hospital showed a higher score in 2019 compared to 2017 (87.6% to 88.7%; F=8.5, p=0.004). Communication with doctors and nurses rating domains had the largest association with overall hospital rating and recommendation of the hospital. Responsiveness of hospital staff was the only HCAHPS domain, which was not statistically associated with overall hospital rating. Patient-level and hospital-level

predictors showed different association patterns across HCAHPS domains and individual items. Patient's overall health rating was a statistically significant predictor for all HCAHPS domains and individual items excluding communication with nurses and communication with doctors' domains. Communication with nurses average score decreased from 92.7% to 89.4% in all hospitals over the study period (F=103.3, p=<0.001). Similarly, communication with doctors scores decreases in all hospitals from 93.2% to 90.1% (F=94.3, p=<0.001)

Conclusions: Improving patient experience and engagement with the healthcare system is an important outcome, which should be evaluated and monitored regularly to assess the progress in achieving the NHS 2018-2022 priorities for Qatar. The findings provide a baseline measure for the HIE on a national level and highlight important factors associated with HIE. This information is helpful for planning and prioritizing national and hospital-level quality improvement projects in Qatar.

DEDICATION

All praise is due to Allah, the Lord of the Worlds, the Beneficent, the Merciful.

To Mom, Dad, Rahma, my loving family and all those who genuinely believed in me.

To COVID-19, who taught us and our healthcare systems a good lesson.

ACKNOWLEDGMENTS

A special acknowledgment of the continuous guidance, patience, professionalism and support of Dr. Mujahed M. A. Shraim (Assistant Professor of Public Health, College of Health Sciences, Qatar University).

I would like to acknowledge the assistance and support of Monitoring and Evaluation team (Healthcare Quality and Patient Safety Department, Ministry of Public Health).

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Chapter 1: Introduction

Hospital inpatient experience (HIE) involves the interactions that the patients' encounter with the healthcare system during their healthcare delivery. It includes the main aspects which patients value or require during their hospital admission, for instance, communication with healthcare providers as doctors and nurses, receiving information about their medication, pain management during the hospital admission and their care plan after discharge (Rapport et al., 2019). Evaluating HIE is an important measure used by healthcare organizations to assess the effectiveness of their current processes and understand how responsive and respectful the healthcare providers are in addressing patient needs and preferences (Ross, 2017; Wolf, 2014; NHS, 2013). Healthcare organizations aim to achieve and sustain a positive HIE by constantly improving the quality and safety of their health services, reducing costs, minimizing and preventing medical complaints or allegations, and building a good reputation among their communities. Also, patients with a positive HIE are more likely to return to their healthcare provider, tend to speak favourably about the hospital on social media and recommend the hospital to family and friends (Jenkinson, Coulter, Bruster, Richards & Chandola, 2002; Kemp, Chan, Mccormack & Douglas-england, 2013; Lavela, 2014).

Currently, the healthcare services in the State of Qatar are growing at a rapid pace. Since the inauguration of the first National Health Strategy (NHS 2011- 2016) in 2011, the healthcare system has heavily invested in expanding the healthcare service provision, added new infrastructure and built workforce capacity and capabilities (National Health Strategy [NHS], 2011-2016). As a result, the population has access to high-quality healthcare and enjoys a good quality of life in line with regional benchmarks. The current National Health Strategy (NHS 2018- 2022) represents a shift in the healthcare vision, one of the strategy's distinctive shifts is to transform the

population from passive recipients of healthcare advice to empowered individuals taking control of their own health (National Health Strategy [NHS], 2018). To accomplish successful outcomes for patients, the NHS 2018- 2022 has highlighted five system-wide priorities, which are: 1) an integrated model of high-quality care and service delivery, 2) enhanced health promotion and disease prevention, 3) enhanced health protection, 4) health in all policies and 5) effective system of governance and leadership. Improved patient experience and engagement is an important outcome of the integrated model of high-quality care and service delivery (NHS, 2018).

There is a lack of studies examining the current status of HIE and related predictors on a national level in the State of Qatar. Such information may help in identifying current strengths and areas for improvement in healthcare delivery in relation to HIE and prioritizing HIE quality improvement projects at national-level and hospital-level. Over and above, listening to patients' voices and addressing their needs is key in shaping the new era of healthcare in Qatar.

1.1 Aim and Objectives

The main aim of this thesis is to conduct a cross-sectional study to assess the overall HIE in Qatar and identify associated factors using the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey from April 2017 to 2019, inclusive.

The thesis objectives are:

1. To describe the HCAHPS summary scores across six composite items (communication with nurses, communication with doctors, communication about medicine, responsiveness of hospital staff, discharge information, and pain management), two hospital-environment single items (cleanliness and quietness of hospital environment), and two global satisfaction scores (patients' overall rating of the hospital and willingness to recommend the hospital).

2. To identify the independent associations between patient-level and hospital-level characteristics, the HCAHPS composite scores, and the hospital-environment scores with the global satisfaction scores (overall rating of the hospital and willingness to recommend the hospital scores).
3. To identify the independent associations between patient-level and hospital-level characteristics with the HCAHPS composite scores and hospital-environment scores.
4. Explore the trends in HCAHPS composite scores, hospital-environment scores, and the global satisfaction scores between April 2017 and 2019, inclusive.

1.2 Research Questions

The thesis research questions are:

1. What are the overall HCAHPS scores for the composite, individual, and global items between April 2017 and 2019 inclusive?
2. What factors (patient-level and hospital-level characteristics and HCAHPS composite and individual items) are independently associated with patients' overall rating of the hospital and willingness to recommend the hospital scores?
3. What patient-level and hospital-level characteristics are independently associated with the HCAHPS composite and individual items' scores?
4. What are the trends in HCAHPS composite items' scores, individual items' scores, and the patients' overall rating of the hospital and willingness to recommend the hospital scores between April 2017 and 2019, inclusive?

Chapter 2: Literature Review

2.1 Importance of Studying Patient Experience of Healthcare

Universally, healthcare services are shifting away from disease-centered care and moving towards patient-centered care. The Beryl Institute defines patient experience as "the sum of all interactions, shaped by an organization's culture, that influence patient perceptions, across the continuum of care" **(**The Beryl Institute, 2010)**.** The National Academy of Medicine (formerly as Institute of Medicine) developed a healthcare quality framework to guide healthcare organizations in improving the quality and safety aspects while providing care to their patients. The healthcare quality framework consists of six domains or components; safety, effectiveness, patient centeredness, timeliness, efficient and equitable, each of these components further contain subgroups of measures to support the healthcare facilities to evaluate these components (Institute of Medicine [IOM], 2001). Safety refers to "avoiding injuries to patients from care that is intended to help them". Effectiveness refers to "providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding overuse and underuse)". Timeliness refers to "obtaining needed care and minimizing unnecessary delays in getting that care". Efficient defined as "voiding waste, including waste of equipment, supplies, ideas, and energy". Equitable refers to "providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status. Finally, patient-centered care defines as "health care that establishes the partnership among practitioners, patients, and their families (when appropriate) to ensure that decisions respect patients' wants, needs, and preferences and that patients have the education and support they need to make decisions and participate in their own care" (IOM, 2001). This includes values and different activities, as treating

patients with dignity, empathy and respect, providing personalized care or treatment, and supporting patient to develop their strengths and enable them to enjoy an independent and fulfilling life. IOM specified patient experience and presence of effective partnership as measures to evaluate patient centeredness, where patients report their experience with defined aspects of healthcare rather than their general opinion about the adequacy of care. IOM institute provided a publicly available strategies to guide healthcare organizations to plan for effective methods to encourage and improve the engagement of patients and their families. (IOM, 2017).

Therefore, healthcare professional's practice and interpersonal skills must go beyond the traditional medicinal relationship to include shared perception regarding treatment decisions, patient preferences and psycho-social support.

Healthcare providers realize that preferred health outcomes differ from one patient to another and patients vary in their treatment expectation and their choice of preferred outcomes (e.g. better pain management, shorter recovery periods and positive treatment results with no complications or adverse events). Consequently, engaging patients and their families in the clinical decisions and aligning their preferred outcomes with personalized healthcare plans will eventually create a strong trustful partnerships with patients (Elliott et al., 2010; Merlino et al., 2013; Rathert, Wyrwich & Boren, 2012; Wang, Loban & Dionne, 2019). Also, patients who are more engaged in their treatment plans demonstrate better adherence to their care plans and follow healthcare providers' recommendations, which will ultimately lead to improved clinical outcomes and eventually reducing medical cost (Cochrane et al., 2015; Doyle, Lennox & Bell, 2013; Jha, Orav, Zheng & Epstein, 2008).

As 'consumers' of healthcare services, capturing patient's response around their healthcare experience may estimate if patient's expectation of care has been achieved

and provides valuable information on the quality of healthcare. For example, a study by Mulley and colleagues (2012) stated that a gap usually occur between what patients wants and what doctors think what patients wants. This kind of assumption from healthcare providers may lead to "patient preference misdiagnosis". Though doctors recognize the importance of asking patients about their preferences, they usually fail to do so (Rozenblum, 2011).

Using surveys as a tool to capture patient's experience and satisfaction with healthcare is a common and widely used method. The results of these surveys can highlight issues from patient's perception, which needs to be addressed by healthcare providers, such as pain management, treatment decisions and coordination of care (Jenkinson et al., 2013). Also, some patients may not perceive that they have a choice of hospital, either because there is only one facility close to their residence, or their health insurance scheme limits their choices, or because their physicians are affiliated with only one hospital. Patient experience surveys can provide a platform for these patients to express their opinion and provide feedback about the healthcare services during their hospitalization period, and begin dialogs with their physicians or hospital management to do whatever they can to ensure that their personal hospital experience will be taken into account (Sofaer, Crofton, Goldstein, Hoy & Crabb, 2005). Moreover, surveys may reveal patients' disappointment with the way services are organized in the hospital such as poor access to care, long waiting times, short consultation slots, and problems in understanding what doctors tell them.

This has implications beyond improving the communication skills of healthcare providers, by affecting the quality of other healthcare outcomes, like adherence to medication, increased utilization of health services, medication errors, occurrence of infections, or unnecessary readmissions after a hospitalization, consequently leading to

increased medical expenses (Doyle, Lennox & Bell, 2013). Among avoidable health care cost, non adherence to medication in the USA is associated with an annual loss of 100 to 300 billion dollars, which represents 3% to 10% of total USA healthcare expenditure (Aurel and MacGuire, 2014). Medication errors in the USA hospital settings had an impact of 4 million preventable hospital readmissions, which is associated with additional 20 billion dollars (Aitken & Valkova, 2013).

Measuring patient experience can be used as method to gauge patient's opinion about important range of hospital characteristics, such as quality of hospital staff, availability of services, affordability of care, accessibility of facilities to patients, quality and cleanliness of hospital environment. A cross-sectional study was conducted in Riyadh, Saudi Arabia involving two public and five private hospitals used patient experience survey to assess the satisfaction level of patients with pre-selected hospital characteristics (Alaiban, Al-Omar, Narine, Al-Assaf, & Javed, 2003). That study found that patients were significantly satisfied with the availability of specialists, the use of high technology in the facility, they valued the presence of Saudi doctors and were satisfied with the quality of hospital staff such as nurses and non-physician personnel. In addition, the patients stated that they attended the facility either because they were living close by the hospital, or had a previous positive experience, or because they heard good feedback from some members of their family or friends who had an earlier good experience with the facility. In the same study, patients who were living far from the hospital expressed their dissatisfaction with scheduling of appointments, high cost of the treatment, and were not happy with the religious background of the hospital staff. Moreover, patients who were paying from their own resources and attending private hospitals were mostly dissatisfied with almost all hospital services, they were disappointed with the quality of staff manner, absence of same sex doctors, length of

waiting time, scheduling of the appointments, and the registration process (Alaiban, Al-Omar, Narine, Al-Assaf, & Javed, 2003).

Thus, providing patient-centered care and enhancing patients' experience can improve the quality of care by increasing the responsiveness of the healthcare systems to address patients' needs, monitor and evaluate healthcare quality improvement projects and initiatives, and highlight implications for future research and quality improvement projects.

HIE surveys also have some important limitations and their findings should be interpreted with caution and not in isolation from other domains or aspects of healthcare quality such as process, structure, and outcome measures as well as other measures of safety and efficiency (Price et al., 2014). This because HIE surveys may simply reflect patients' expectations regardless of whether they received high quality evidence-based care or not (Fenton et al., 2012). Despite the reported strong associations between better patient satisfaction scores with other measures of healthcare quality (e.g. mortality, adherence with treatment regimens, re-admission, etc.), such associations may not be causal, and therefore, greater efforts should be devoted to monitor and improve other aspects of healthcare quality (Doyle et al., 2013). Moreover, HIE surveys do not provide a direct measure of level of patient and family engagement and participation in decision making and any potential barriers to adherence with recommended treatment plans (Browne et al., 2010). For example, HIE surveys do not include free-text or open-ended question to allow patients and family members to elaborate on important aspects of their encounter with healthcare facilities. In addition, the validity of HIE surveys outcomes could be influenced by diverse factors other than how patient perceive patient-centeredness efforts by healthcare facilities. For example, it is not clear if the survey outcome are representative of all patients' experiences due to the potential for selection

bias, small sample size, survey mode, surveying patients at different time points, experience of patient at home after discharge, and other factors beyond the control of healthcare facilities (Price et al., 2014; Fenton et al., 2012). In addition, the HIE surveys may not strictly reflect the overall patient encounter with healthcare facilities (e.g. multiple admissions may be associated with variations in individual patient experience (Price et al., 2014).

2.2 Assessment Methods for Patient Experience of Healthcare

HIE can be measured on an institutional or national level by conducting various valid patient experience or patient satisfaction measurement tools. Several health governments and major healthcare organizations use patient experience scores - among other indicators - as a measure to assess the quality of their healthcare services, prioritize national projects or initiatives and compare the overall performance of the hospitals within their region (Decourcy, West & Barron, 2012; Kemp, Santana, Southern & Mccormack, 2016; NHS Confederation, 2010; The Health Foundation, 2013). For example, England's patient reported experience measures (PREMs) and patient's reported outcomes (PROMS) initiatives collect and publicly report patient level data on four elective surgical procedures (Black, 2013). The USA apply the scores of patient experiences among other quality and clinical measures to incentivize healthcare providers and pay based on their performance (Chatterjee, Joynt, Orav & Jha, 2012; Delloite, 2016; Price et al., 2014). For instance, the Centers for Medicare and Medicaid (CMS) are using a standard survey instrument called "Hospital Consumer Assessment of Healthcare Providers and Systems" (HCAHPS) to survey inpatients about their experience of care since 2008 (Centers for Medicare and Medicaid Services [CMS], 2020). All Medicare and Medicaid hospitals are federally mandated to participate in HCAHPS, and the results of the surveys are published on the CMS's website. As part

of Hospital Value-Based Purchasing Program, CMS is withholding about 1% of the Medicare payments (30% of which is based on HCAHPS scores) to fund the incentive programs (Mehta, 2015). In addition, since providing a higher quality care is directly linked to a hospital's revenue, many hospitals work on enhancing their patient's experience to achieve higher HCAHPS scores.

2.3 Summary of Studies Using the HCAHPS Survey

Several studies used the HCAHPS survey to compare patient experience results over years to monitor the progress in certain domain of their interest. For example, in a cohort study by Gupta et al., (2014), the HCAHPS reports from 2008 to 2012 were analyzed and showed improvement in patient's pain perception during the study period. Sheetz and colleagues (2014) used the overall satisfaction score from HCAHPS surveys during the period 2008 to 2012 to assess the postoperative morbidity and mortality and patients' perceptions of care and reported that patients' perspective of care did not associate with the incidence of morbidity and mortality after major surgery.

Other studies assessed single HCAHPS domains or global items according to patient characteristics. A study by Klinkenberg et al., (2011) explored the relation between willingness to recommend the hospital to family and friends with other patient experience predictors. They found that hospitals which focuses on improving communication skills of healthcare providers such as doctors and nurses besides room cleanliness will be most likely to find improvements in their patient experience scores. Elliot et al., (2012) examined the association of patient's gender with different aspects of patient's experience, and in a separate study in 2010, they evaluated hospital ranking variation with patient demographics. Goldstein et al. (2010) conducted an analysis of racial and ethnicity in patients' perceptions of inpatient care using the HCAHPS survey and found that, on average, non-Hispanic Whites had higher HCAHPS composite scores

than Hispanic, African American, Asian-Pacific Islander, or multiracial patients. In a literature review by Price et al., (2014), studies were gathered to examine the association between patients experience and different measures of healthcare quality. They found that healthcare professionals might achieve better or worse on measures in patient experience domain than on clinical process measures. They also stated that at hospital-level the association between clinical process measures and HCAHPS domains are marginally significant. For example, 1 out of 12 hospitals were in the top quartile on both clinical process measures and HCAHPS in 2006 and 2007, while 1 in 6 were higher in clinical measures only and 1 out of 6 were higher in HCAHPS only (Lehrman et.al, 2010). A study by Girotra, Cram and Popescu (2012) found that some hospitals with high overall HCAHPS scores performed badly on cardiac process measures, and vice versa.

Healthcare providers implemented various interventions in order to improve patient experience scores. A systematic review was done by Davidson et al., (2017) to assess improvements using HCAHPS scores after applying different type of interventions. They found most of the studies were of low quality, among the satisfactory quality studies most of interventions were commonly included the following HCAHPS domains; communication with nurses, communication with doctors, pain management, communication about medicine, hospital recommendation and overall rating of the hospital. A study with pre and post assessment found the constructing a new hospital building improved cleanliness of hospital environment but didn't have an influence on the other HCAHPS domains (Siddiqui, Zuccarelli & Durkin, 2015). One intervention included pharmacy team participating in team rounds and providing education sessions for patients, the pre and post assessment included patients hospitalized before and after the intervention. They found a significant improvement in

inpatient experience scores for communication about medicine (Soric, Glowczewski & Lerman, 2016). Other studies in the same systematic review didn't find any statistical significance after implementing interventions. For example, in two randomized control trials to improve doctor's communication, one was through training program and providing immediate patient experience feedback (Indovina, Keniston & Reid, 2016), and the other by providing patients with doctor's face card (Simons, Caprio & Furiasse, 2014). Both interventions had positive trends but not statistically significant. Another pre and post assessment study for having a communication skill program for healthcare providers didn't improve the scores on communication with doctors neither with the overall rating of the hospital domains (O'Leary, Darling & Rauworth, 2013). The systematic review concluded that most designed interventions were addressing improvements in specific domains or examined the relationship between patient and hospital characteristics mainly using one of very few domains. Therefore, research examining the significant and independent predictors of all domains covering HIE provides more useful information about current healthcare quality and inform future healthcare quality improvement plans.

Jadotte, Chase, Qureshi, Holly and Salmond (2017) used HCAHPS survey as a potential tool to assess the organizational interprofessional competency in American hospitals. It is well stablished that organizational culture can influence the collaborative behavior, create a patient centered care and enhance organizational policies to support staff, create a culture of safety rather than blame and sustain staff learning and development, all that collectively will improve interprofessional competency resulting in providing collaborative team work and care. They found that all interprofessional competency domains such as values and ethics, interprofessional communication, teams and teamwork, and roles and responsibilities were reflected in the HCAHPS survey. The

survey questions capture the communication skills and responsiveness of the staff, especially for doctors and nurses which are the largest workforce in any healthcare setting providing direct care to the patients. Although HCAHPS survey was not designed to capture the information regarding interprofessional competencies, the survey results could be utilized as a proxy to reflect the interprofessional competency and the organizational culture.

2.4 Main Patient-level and Hospital-level Predictors of hospital inpatient experience using the HCAHPS Survey

Majority of the studies examined diverse combinations of patient-level and hospital-level characteristics to measure their influence on patient experience. Higher levels of self-reported overall health status, level of education, younger age, and American Indian ethnicity are associated with higher levels of patient satisfaction (Elliott, 2010). However, racial or ethnic minorities, especially Asian-Pacific Islanders, were less likely to report higher levels of patient satisfaction (Goldstein, 2010). Patients with better pain control and those receiving care at critical access or government owned hospitals were more likely to be satisfied with their care and report a positive overall satisfaction and higher satisfaction scores for pain management (Gupta, 2009; Hanna, 2015). Satisfaction with nursing, physician, responsiveness of staff, and hospital environment among Black and White patients were associated with higher levels of overall satisfaction. For both groups of patients, satisfaction with nursing was the most important determinant of overall patient satisfaction (Otani, 2012). Most of the studies found that the main predictors of overall patient experience and willingness to recommend the hospital were satisfaction with nursing and doctor communication regardless of the reason for hospitalization (Craig Otani & Herrmann, 2015; Elliot et al., 2009).

A study by Jha et al., (2008) found that hospitals with higher ratios of nurse-to patient days, and that had higher clinical processes compliance were significantly more likely to receive higher overall patient satisfaction. In addition, private hospitals were negatively associated with overall patient satisfaction, and teaching status of the hospitals was not significantly associated with patient satisfaction. A study by Stimpfel (2012) reported that increase in proportion of nurses working shifts of more than 13 hours was negatively associated with all patient experience domains. Another study showed that specialty hospitals had higher patient satisfaction scores than general hospitals (Siddiqui, 2014). Smaller hospitals size and those who were owned by the government were positively associated with all of patient experience domain (Lehrman, 2010). Greater cultural competency and positive perceptions about patient safety culture were significantly associated with better HCAHPS scores (Sorra, 2014; Weech-Maldonado, 2012)

Finally, Donabedian said: ‘‘It is when we help consumers help us that they can make their greatest contribution to enhancing the quality of care, even as we make ours’’.

Chapter 3: Methods

3.1 Study Design

The study was a cross-sectional study design since the patients were surveyed once and relevant information taken from them during their hospitalization period. The study design allowed us to estimate the overall inpatient experience from 2017 to 2019.

3.2 Study Setting

Secondary data from the Ministry of Public Health (MOPH) about HIE from nine public hospitals and three private hospitals in the State of Qatar. All the hospital included in the study were part of ongoing Health Services Performance Agreements Program (HSPAs). HSPAs program was one of the NHS (2011-2016) projects, which is overseen by MOPH to monitor the performance of healthcare facilities based on selected indicators (NHS, 2016). The primary data was collected by hospitals using the HCAHPS survey, and the hospitals share the HCAHPS survey raw data to the MOPH on a bi-annual basis.

3.3 Study Population

Inpatients admitted in public and private hospitals in Qatar from April 2017 to December 2019, inclusive.

3.4 Inclusion Criteria

The hospitals select eligible inpatient to conduct the HCAHPS survey based on the following inclusion criteria:

- Patient must be 18 years or older at the time of admission.
- Patients alive at discharge.
- Inpatients who had at least one overnight stay at the hospital. An overnight stay is defined as an inpatient admission in which the patient's admission date is

different from the patient's discharge date. The admission need not be 24 hours long.

- Exclusive stays in holding areas within Emergency Departments are not considered admissions for the purposes of this survey.

3.5 Exclusion Criteria

The hospitals identify the ineligible patients for HCAHPS surveys following these exclusion criteria:

- Inpatients with less than an overnight stay at the hospital.
- Patients dead at discharge.
- Multiple discharges.
- Special patient population: receiving care primarily for a psychiatric condition (e.g. bipolar disorder, or depression). Patients whose principal diagnosis falls within the maternity, medical or surgical service lines and who also have a secondary psychiatric diagnosis are still eligible for the survey.

3.6 Sampling

The study sample has included all the available HIE responses between April 2017 and 2019, inclusive.

3.7 Data Collection

The MOPH receives data from private and public healthcare facilities as part of the national governance. Different departments within the MOPH in Qatar are responsible for observing the healthcare status within the country. HIE is one of the national indicators monitored biannually by the Healthcare Quality and Patient Safety Department (HQPS).

HCAHPS surveys were adopted by the MOPH and are used in hospitals on a national level since April 2017. The survey is conducted either in English or Arabic languages.

A systematic review by Beattie, Murphy, Atherton and Lauder (2015) examined the psychometric properties of different patient experience survey tools and found that HCAHPS questionnaire items were relevant, sufficient, and rated positively for content validity. The internal consistency to determine the interrelatedness among items (Cronbach's α) was 0.70 and the reliability (intraclass correlation) was 0.70. The hospital-level reliability of the survey's six composite domains for a sample of 300 respondents per hospital is expected to generally exceed 0.70 with an estimated range of 0.66 to 0.89 and a median of 0.88 (Keller et al, 2005). The Arabic version of the HCAHPS survey used in Qatar was adapted from a translated HCAHPS instrument used in Saudi Arabia and approved by the Translation Department at the MOPH before implementation. The psychometric properties of the Arabic version of the HCAHPS were evaluated in hospitals of King Abdulaziz Medical City in Riyadh in 2012(Alanazi, Alamry & Al-Surimi, 2017). The study findings showed that the overall Cronbach's α for the Arabic version of HCAHPS was 0.90, representing good internal consistency across all survey domains, with Cronbach's α ranging from 0.70 to 0.97. The correlation coefficient between each statement for each separate domain revealed a highly positive significant correlation ranging from 0.72 to 0.89. The results of the study showed the validity and reliability of the Arabic version of HCAHPS and was highly recommended to be applied in the context of other Arab countries (Alanazi, Alamry & Al-Surimi, 2017). Another Arabic translated version was tested in hospitals of Jeddah and the scales demonstrated acceptable internal consistency for the survey domains. The Spearman's correlation coefficient was 0.33 to 0.75 ($P<0.01$) and Cronbach's α ranged from 0.52 to 0.85 for all six domains, two individual items and two global items (Dockins, Abuzahrieh, & Stack, 2013). A study in Lebanon stated that item–item correlations for the survey items ranged from 0.52 to 0.92, the Cronbach's α coefficient was 0.87, in

addition to adequate level of construct and predictive validity (Al Kouatly et al, 2015). The study authors recommended the survey to be used in hospitals in Lebanon and other Middle Eastern countries to facilitate benchmarking and quality improvement. Therefore, The Arabic translation and adaptation of the HCAHPS is a valid, reliable, and feasible tool for evaluation and benchmarking of inpatient satisfaction in Arabic speaking populations.

The questionnaire contains ten measures of HIE of certain aspects of healthcare rather than the patient satisfaction with the healthcare received. The HCAHPS's ten measures consists of six composite measures (communication with nurses, communication with doctors, responsiveness of hospital staff, pain management, communication about medicines and discharge information), two individual items (cleanliness and quietness of patient's room) and two global items (patient's overall rating of the hospital and if they would recommend the hospital to their family and friends) (AHRQ, 2018).

The response to survey questions are Likert-type scales, the options to the six composite items' questions and two individual measures are: never, sometimes, usually and always. The first global item includes a question about the overall rating of the hospital using 0 to 5 scoring scale, where (0) indicates "worst hospital possible" and (5) indicates "best hospital possible". The second global item includes a question about patient's willingness to recommend the hospital to family and friends with response options: "definitely no, probably no, probably yes and definitely yes". The questionnaire also collects information on gender (male, female); age group in years (18-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75 and older); patient's education level (elementary, preparatory, secondary, university graduate, and post graduate); patient's perception of overall health (excellent, very good, good, fair, and poor); and patient's country of origin

entered as a free text (CAHPS, 2017). The English and Arabic versions of HCAHPS surveys are presented in appendices A and B.

3.8 Measures

3.8.1. Outcome Variables

The outcome variables were the overall rating of the hospital, willingness to recommend the hospital, and the HCAHPS composite and individual items' scores. The overall rating of the hospital is measured on a scale ranging from 0 as "worst hospital possible" to 5 as "best hospital possible". For ease of interpretation, this variable was rescaled to the range of 0 to 100 (0=0, 1=20, 2=40, 3=60, 4=80, and 5=100). Similarly, the willingness to recommend the hospital variable was rescaled to 0-100 (definitely no=0, probably no=33.33, probably yes= 66.66, and definitely yes= 100) (Day et al., 2014; Elliot et al., 2012). The six domains and the two individual items of the HCAHPS are individual level variables and were also rescaled to 0-100 point. For example, if the response scale to a question was "never", "sometimes", "usually", and "always", it was converted to 0, 33.33, 66.66, and 100, respectively. The questions with "yes" and "no" responses where converted to 0 for "no" and 100 for "yes" (Norman, 2010; Sullivan, & Artino, 2013). The mean scores for HCAHPS domains were calculated based on the following formula:

sum of all normalized questions' point scores in the domain/ number of the questions in the domain (Kemp, Mccormack, Chan, Santana & Quan, 2015). For instance, the mean score for communication with doctor domain, which include three questions, was calculated by summing the scores for doctor respect, doctor listening and doctor explanations and questions and then dividing the total by 3. The surveys with missing responses to either of the two HCAHPS global satisfaction scores will be omitted from the analysis.

3.8.2. Predictor Variables

The predictor variables were classified as either hospital-level or patient-level predictors. Hospital-level variables include hospital type and hospital bed capacity and were the only two hospital related variables available from the HQPS database. Hospital type was categorized as public or private depending on the scope of practise and funding scheme. The hospital bed capacity was provided as number of beds in each hospital. The number of beds varied between hospitals; therefore, it was categorized into four groups after calculating the quartiles into; less than 61 beds, 61 to 133 beds, 134 to 287 beds and more than 287 beds.

The patient-level predictors included the six domains and the two individual items of the HCAHPS, age group, gender, education level, nationality (Qatari, non-Qatari), and patient's perception of overall health.

3.9 Statistical Analysis

Descriptive statistics were used to summarize the patients and hospital characteristics, using mean and standard deviation for continuous variables and frequency with percentage for categorical variables.

Due to the hierarchical structure of the data, clustering of patients within hospitals, multivariable multilevel linear regression was used to analyse the data (Dorieke et al., 2009). The analysis was conducted in five modelling steps for each outcome, each model has two variance components. The first variance component represents between hospitals variance, while the other represents within hospitals variance.

Model 1 or the "empty model" with no predictor variables was conducted and the mean for the outcome is estimated across all hospitals, also the two variance components from the model were used to calculate the intraclass correlation coefficient (ICC), which compute the percentage of the total variance in the outcome explained by hospital-level

factors (Koo & Li, 2016). The ICC can be calculated by the following formula:

%ICC = [between hospital variance/ (between hospital variance + within hospital variance)] x100 (Shraim, Cifuentes, Willetts, Marucci-Wellman & Pransky, 2015). Model 2 included hospital level variables (hospital type and bed capacity) to examine the independent associations between the hospital level variables with the outcome variable, and also estimate the proportional reduction in the original between hospital variance accounted for by included hospital level variables. The proportional reduction between hospital variance was computed using the formula:

[1- (between hospital variance of model 2/ between hospital variance in model 1)].

Model 3 included hospital level variables as well as patient level variables as fixed effects only. Again, the proportional reduction in variance is calculated using variance components from model 3 and model 1, which indicates the amount of variance in the outcome variable explained by hospital-level variables while controlling for patient-level variables. Model 4 included variables from model 3 and examined the random effects of statistically significant patient-level variables one at a time to assess whether the relationship between the patient-level variables with the outcome differ across hospitals. All patient-level variables with statistically significant random effects were retained as random effects in the final model (model 5). Accordingly, model 5 included all hospital-level and patient-level variables as fixed effects plus the statistically significant random effects of the patient-level variables. Log Restricted Likelihood (-2LL) was used to compare between the models to assess the model which fits the data best, the smaller -2LL indicates a better model (Whittaker & Furlow, 2009). The steps of including hospital and individual level variables in the models are presented in table 1.

Table 1. Steps of Including Hospital-level and Patient-level Variables in Models

	Hospital Level as Fixed Effects	Patient Level Variables as Fixed Effects	Patient Level Variables as Random Effects
Model 1	-	-	-
Model 2	✓	-	-
Model 3	✓	✓	-
Model 4	✓	✓	✓ (one variable at a time)
Model 5	✓	✓	✓(only those that were statistically significant in model 4)

The average scores for the HCAHPS domains and the associated predictors were assessed through performing similar statistical models for each domain as an outcome and including patient-level variables. The distribution of the overall satisfaction and willingness to recommend the hospital scores were negatively skewed and performing the log transformation was not successful in normalizing their scores. Therefore, bootstrap sampling and estimation method was used in all regression analyses to account for the outcome skewness and the small number of clusters in the multilevel model (Visalakshi & Jeyaseelan, 2013). The non-parametric bootstrap method was used in all linear regression analyses, with 1000 repetitions and using different seed number of 0 (STATA. nd). For example, to run the empty model for overall hospital rating, the following Stata syntax was used: bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating || Hospital: reml. Appendix N provides a complete list of command syntax used to run the regression analysis. The observations with missing responses were not omitted from the dataset except in case of missing responses for overall hospital rating and willingness to recommend the hospital to family and friends. Removing of cases with missing responses was done manually before the analysis, and no imputation of missing data was performed (Rubin, 1976; Sterne et al., 2009). The association between the predictor variables and the study outcome variables were

modelled as an increase in one unit in the outcome variable is a function of increase in one unit of predictor variable.

Linear trend with one-way ANOVA was used to explore trends in HCAHPS's domain items, the two hospital-environment items, and the global satisfaction scores over the study period. Statistical significance was determined using an alpha level of 0.05 and two-tailed tests, and 95% confidence intervals to estimate the precision of associations. The analysis was performed using Stata 15.1/MP statistical package.

3.10 Ethical Considerations

A request was submitted to HQPS department to obtain the available data of years 2017, 2018 and 2019 to be used for this study. The received data file included de-identified data and no patient or hospital information was shared. The study data was stored in a password-protected computer for the study personnel.

Ethical approvals for this study were obtained from MOPH and Qatar University prior to study execution, the IRB approvals are presented in appendices O and P. The study ensured the following ethical considerations during and after the study period:

- The study was held with transparency and all communications were documented.
- Data files were secured, and limited access was permitted to study personnel.
- The study results will be shared with the HQPS department at MOPH

Chapter 4: Results

4.1 Characteristics of patients and hospitals

Total number of surveys received from HQPS included 15,046 HIE surveys for the period from April 2017 to December 2019. A total of 679 surveys did not provide responses for overall rating of hospital and/or hospital recommendation (outcomes) and were excluded. A total of 14,367 surveys were included in the analysis, in 2017 the total number of surveys were 4568 (31.8%) in addition to 4975 (34.6%) and 4824 (33.6%) surveys conducted in 2018 and 2019 correspondingly.

There were 12 hospitals in the study sample, 9 public and 3 private hospitals. 29.8% of the surveys were from hospitals, which had more than 287 bed capacity and 21.2% were from hospitals with less than 61 beds.

The sample was primarily of non-Qatari (72.5%) and significant proportion of patients were aged between 25 and 34 years (36.9%), females (53.2%) and university graduate (42.9%). About 36.7% of patients rated their overall health as “good”, and 20.3% as “excellent”. Patient and hospital characteristics are presented in table 2. The characteristics of patient by hospital type and patient responses to each domain questions are presented in comprehensive details in appendices C and D, respectively.

Communication with doctor’s domain had the highest mean score among HIE domains (92.1%), followed by communication with nurses (91.8%), responsiveness of staff (87.7%), pain management (87.4%), cleanliness of hospital environment (87.0%), communication about medicine (84.4%), quietness of hospital environment (83.4%). Discharge information had the lowest mean score among all HIE domains (74.2%).

Table 2. Patient and Hospital Characteristics

Patient and Hospital Characteristics	Frequency (%)
Patient's overall health rating	
Excellent	2914 (20.3%)
Very good	4666 (32.5%)
Good	5265 (36.7%)
Fair	1170 (8.1%)
Poor	77 (0.5%)
Missing	275 (1.9%)
Age group	
18-24 years	1230 (8.6%)
25-34 years	5299 (36.9%)
35-44 years	4101 (28.5%)
45-54 years	2013 (14.0%)
55-64 years	1032 (7.2%)
65-74 years	343 (2.4%)
75 years or older	137 (1.0%)
Missing	212 (1.5%)
Gender	
Male	6280 (43.7%)
Female	7643 (53.2%)
Missing	444 (3.1%)
Education level	
Elementary level	1260 (8.8%)
Preparatory level	1009 (7.0%)
Secondary level	4059 (28.3%)
University graduate	6164 (42.9%)
Postgraduate	1159 (8.1%)
Missing	716 (5.0%)
Nationality	
Qatari	3527 (24.6%)
Non-Qatari	10415 (72.5%)
Missing	425 (3.0%)
Hospital bed capacity	
Less than 61 beds	3043 (21.2%)
61 to 133 beds	4056 (28.2%)
134 to 287 beds	2993 (20.8%)
More than 287 beds	4275 (29.8%)
Total number of surveys by hospital type	
Public	10308 (71.8%)
Private	4059 (28.3%)

4.2 Associations between Hospital-Level and Patient-Level Predictors with Overall Hospital Rating

Associations between hospital-level and patient-level variables with the overall hospital rating in models 1-5 are summarized in table 3. In multivariate multilevel regression, model 1 (the empty model) showed significant variability between the hospitals in mean overall hospital rating. The ICC indicated that 10% of the variability in mean overall hospital rating can be explained by hospital-level variables (table 3). In model 3, the hospital-level and patient-level variables were added as fixed effect, the variables accounted for 7% reduction in between hospital variance in overall hospital rating. In the final model (model 5) for overall hospital rating, the -2LL was (-23686) indicating that model 5 had the best fit for the data (χ^2= 666.59, p-value = <0.001). The random effects (associations) of all domains, individual items, gender, nationality, and overall health rating with the overall hospital rating varied significantly between hospitals , and thus were retained in model 5 as random effects.

Parameter estimates for the associations between hospital-level and patient-level variables with the overall hospital rating are shown in table 4. The national average for overall hospital rating from 2017 to 2019 was 88.9%. The mean overall rating of hospital for in private hospitals was 5.2% higher than the public hospital (95% CI -6.8, 17.2) while controlling for other variables, but this association was not statistically significant. Similarly, the average overall rating of hospitals with 134 beds and more was almost lower by 7% than hospitals with bed capacity less than 61 beds and the association was statistically not significant (95% CI -19.9, 5.9).

As shown in table 4, lower levels of patient's overall health status were significantly associated with lower overall hospital rating scores. For example, patients reporting poor and very good overall health status had lower overall hospital rating

scores than those reporting excellent overall health status by 14.8% (95% CI 7.9, 21.7) and 2.4% (95% CI 1.5, 3.3), respectively. Qatari inpatient's average overall rating of hospital was lower by 1.4% than non-Qataris (95% CI 0.4, 2.3). Older inpatients and those with higher education levels had higher hospital rating scores in comparison to younger patients and those with lower education levels. However, some of the associations were not statistically significant (table 5). Male inpatients were 0.5% less than females in hospital average overall rating (95% CI -1.3, 0.2), and inpatient's gender was not significantly associated with overall hospital rating.

All HCAHPS domains (except for responsiveness of hospital staff) and individual items had statistically significant associations with overall hospital rating (table 5). Communication with nurses and communication with doctors had the largest modest associations with overall hospital rating, whereas discharge information had the smallest association with overall hospital rating. For example, an increase in nursing communication rating by 1% was associated with an increase in overall hospital rating by 0.1% (95% CI 0.06, 0.15). Similarly, an increase in rating of discharge information by 1% was associated with higher overall hospital rating by 0.02% (95% CI 0.004, 0.03).

Table 3. Parameter Estimates from Multilevel Regression Models Examining the Associations Hospital-Level and Patient-Level Variables with Overall Rating of Hospital

	Overall Rating of Hospital				
Parameters	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	88.9	95.2	48.1		49.6
Hospital type					
Public hospital		Ref			
Private hospital		-4.4*	-4.0*		5.2
Hospital bed capacity (beds)					
Less than 61 beds		Ref			
61-133 beds		-6.3*	-1.0		-0.6
134-287 beds		-5.8*	-2.9*		-7.0
More than 287 beds		-8.4*	-3.8*		-7.7
Patient's overall health rating					
Excellent			Ref		
Very good			-2.4*		-2.4*
Good			-4.9*		-4.6*
Fair			-6.5*		-6.3*
Poor			-15.4*		-14.8*
Age (years)					
18-24 years			Ref		
25-34 years			-0.2		0.1
35-44 years			0.7		1.0
45-54 years			0.8		1.1
55-64 years			2.0*		2.0*
65-74 years			2.3		2.4
75 years or older			1.3		1.2
Gender					
Female			Ref		
Male			-1.2*		-0.5
Education level					
Elementary level			Ref		
Preparatory level			-0.7		0.1
Secondary level			1.2		1.2
University graduate			1.6*		1.4*
Postgraduate			0.5		0.4
Nationality					
Non-Qatari			Ref		
Qatari			-1.2*		-1.4*

Parameters	Overall Rating of Hospital				
	Model 1	Model 2	Model 3	Model 4	Model 5
Patient experience domains					
Communication with nurses			0.11*		0.10*
Communication with doctors			0.11*		0.10*
Responsiveness of hospital staff			0.02*		0.02
Pain management			0.07*		0.07*
Communication about medicine			0.08*		0.07*
Discharge information			0.02*		0.02*
Cleanliness of hospital environment			0.08*		0.07*
Quietness of hospital environment			0.05*		0.05*
Variance components					
Within hospital level (Residual)	207.4	207.4	146.4		138.3
Between hospital level (Variance)	22.8	25.1	21.2		398.1
Model fit statistic					
Log Restricted Likelihood	-58735.4	-58724.9	-23786.6		-23686.0
Random effects parameters (Model 4)					
Overall health rating				1.84*	
Gender				11.28*	
Nationality				4.40*	
Communication with nurses				0.02*	
Communication with doctors				0.01*	
Responsiveness of hospital staff				0.004*	
Pain management				0.02*	
Communication about medicine				0.003*	
Discharge information				0.001*	
Cleanliness of hospital environment				0.004*	
Quietness of hospital environment				0.002*	

Ref: Reference category
*P-value <0.05

Table 4. Adjusted Associations Between Hospital-Level and Patient-Level Variables with Overall Rating of Hospital in Multivariable Multilevel Regression (Model 5)

Parameters	Overall Rating of Hospital			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Intercept	49.6	6.1	(37.7, 61.6)	<0.001
Hospital type				
Public hospital	Ref			
Private hospital	5.2	6.1	(-6.8, 17.2)	0.396
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-0.6	7.1	(-14.5, 13.3)	0.933
134-287 beds	-7.0	6.6	(-19.9, 5.9)	0.288
More than 287 beds	-7.7	6.8	(-21.0, 5.6)	0.255
Patient's overall health rating				
Excellent	Ref			
Very good	-2.4	0.5	(-3.3, -1.5)	<0.001
Good	-4.6	0.5	(-5.6, -3.6)	<0.001
Fair	-6.3	0.9	(-8.0, -4.6)	<0.001
Poor	-14.8	3.5	(-21.7, -7.9)	<0.001
Age (years)				
18-24 years	Ref			
25-34 years	0.1	0.6	(-1.0, 1.2)	0.881
35-44 years	1.0	0.6	(-0.2, 2.2)	0.099
45-54 years	1.1	0.7	(-0.2, 2.4)	0.091
55-64 years	2.0	0.7	(0.6, 3.5)	0.006
65-74 years	2.4	1.2	(0.1, 4.7)	0.045
75 years or older	1.2	2.7	(-4.0, 6.4)	0.654
Gender				
Female	Ref			
Male	-0.5	0.4	(-1.3, 0.2)	0.166
Education level				
Elementary level	Ref			
Preparatory level	0.1	0.9	(-1.6, 1.8)	0.923
Secondary level	1.2	0.6	(-0.02, 2.4)	0.055
University graduate	1.4	0.7	(0.1, 2.7)	0.039
Postgraduate	0.4	0.8	(-1.3, 2.0)	0.647
Nationality				
Non-Qatari	Ref			
Qatari	-1.4	0.5	(-2.3, -0.4)	0.004

Parameters	Overall Rating of Hospital			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Patient experience domains and items				
Communication with nurses	0.10	0.02	(0.06, 0.15)	<0.001
Communication with doctors	0.10	0.02	(0.06, 0.14)	<0.001
Responsiveness of hospital staff	0.02	0.01	(-0.01, 0.04)	0.133
Pain management	0.07	0.02	(0.04, 0.1)	<0.001
Communication about medicine	0.07	0.01	(0.05, 0.09)	<0.001
Discharge information	0.02	0.01	(0.004, 0.03)	0.008
Cleanliness of hospital environment	0.07	0.01	(0.05, 0.09)	<0.001
Quietness of hospital environment	0.05	0.01	(0.03, 0.07)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

4.3 Associations between Hospital-Level and Patient-Level Predictors with Willingness to Recommend Hospital to Family and Friends

Associations between hospital-level and individual-level variables with the overall hospital recommendation in models 1-5 are summarized in table 5. Model 1 of the multivariate multilevel regression showed significant variation between hospitals in overall mean recommendation of hospital. The ICC indicated that 10% of the variability in mean recommendation of hospital can be explained by hospital-level variables. In model 3, when hospital-level and patient-level variables were added as fixed effects, hospital-level variables (hospital type and bed capacity) accounted for 14% of the original variability (10%) in overall hospital recommendation accounted for by hospital-level characteristics (table 5). The final model (model 5) had the smallest -2LL (-25426.1) indicating model 5 was the best fit model for the data (χ^2= 668.59, p-value = <0.001).

The national average of overall hospital recommendation to family and friends from 2017 to 2019 was 89%. Table 6 presents parameter estimates for the associations between hospital-level and patient-level variables with overall hospital recommendation. On average, private hospitals had higher overall hospital recommendation by 6.1% than public hospitals, but this was not statistically significant (95% CI -7.6, 19.9). Similarly, no statistically significant association was found between bed size capacity and overall hospital recommendation (table 6). Lower levels of overall health status rating were significantly associated with lower overall hospital recommendation. For instance, patients who reported having poor and very good overall health status had lower overall hospital recommendation scores than those who reported excellent overall health status by 16.5% (95% CI 6.3, 26.6) and 1.0% (95% CI 0.2, 2.2), respectively.

Male inpatients' mean recommendation of hospital was higher by 1.9% than female inpatients and this association was statistically significant (95% CI 0.9, 2.8). Higher education level was associated with higher overall hospital recommendation; however, this did not reach statistical significance for preparatory and postgraduate education level categories as compared to elementary education level. Age group and nationality had no statistically significant relationships with overall hospital recommendation (table 6). Recommendation of hospital was significantly associated with all HCAHPS domains and individual items. Communication with nurses and communication with doctors had the largest associations with overall hospital recommendation, whereas responsiveness of staff, discharge information, and quietness of hospital environment, equally, had the smallest associations with overall hospital rating. An increase in nursing communication rating and doctor communication by 1% were associated with an increase in overall hospital recommendation by 0.15% (95% CI

0.1, 0.2) and 0.13% (95% CI 0.1, 0.2), respectively. An increase in perceived hospital quietness by 1% was associated with an increase in overall hospital recommendation by 0.03% (95% CI 0.01, 0.10).

Table 5. Parameter Estimates from Multilevel Regression Models Examining the Associations of Hospital-Level and Patient-Level Variables with Recommendation of Hospital to Family and Friends

	Recommendation of Hospital				
Parameters	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	89.0	94.5	43.7		41.1
Hospital type					
Public hospital		Ref			
Private hospital		-0.8	-1.1		6.1
Hospital bed capacity (beds)					
Less than 61 beds		Ref			
61-133 beds		-6.8*	-1.9*		-1.7
134-287 beds		-4.0*	-2.9*		-0.4
More than 287 beds		-10.3*	-6.1*		3.2
Patient's overall health rating					
Excellent			Ref		
Very good			-0.7		-1.0
Good			-4.2*		-4.1*
Fair			-5.7*		-6.2*
Poor			-14.4*		-16.5*
Age (years)					
18-24 years			Ref		
25-34 years			-0.7		0.1
35-44 years			-0.2		0.7
45-54 years			-1.4		-0.9
55-64 years			0.3		0.3
65-74 years			1.3		1.4
75 years or older			2.6		2.9
Gender					
Female			Ref		
Male			-2.9*		-1.9*
Education level					
Elementary level			Ref		
Preparatory level			-3.2*		1.1
Secondary level			0.9		2.8*
University graduate			1.5		2.9*
Postgraduate			-0.1		2.4
Nationality					
Non-Qatari			Ref		
Qatari			-1.4*		-0.9

Parameters	Recommendation of Hospital				
	Model 1	Model 2	Model 3	Model 4	Model 5
Patient experience domains and items					
Communication with nurses			0.19*		0.15*
Communication with doctors			0.14*		0.13*
Responsiveness of hospital staff			0.04*		0.03*
Pain management			0.04*		0.04*
Communication about medicine			0.08*		0.07*
Discharge information			0.03*		0.03*
Cleanliness of hospital environment			0.05*		0.05*
Quietness of hospital environment			0.01		0.03*
Variance components					
Within hospital level (Residual)	319.1	319.1	266.9		244.3
Between hospital level (Variance)	36.7	35.8	31.7		369.2
Model fit statistic					
Log Restricted Likelihood	-61829.1	-61817.2	-25599.8		-25426.1
Random effect parameters (Model 4)					
Overall health rating				5.79*	
Gender				27.45*	
Nationality				14.48*	
Communication with nurses				0.02*	
Communication with doctors				0.01*	
Responsiveness of hospital staff				0.01*	
Pain management				0.02*	
Communication about medicine				0.005*	
Discharge information				0.004*	
Cleanliness of hospital environment				0.01*	
Quietness of hospital environment				0.01*	

Ref: Reference category
*P-value <0.05

Table 6. Adjusted Associations Between Hospital-Level and Patient-Level Variables with Recommendation of Hospital to Family and Friends in Multivariable Multilevel Regression (Model 5)

Parameters	Recommendation of Hospital			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	41.1	6.4	(28.4, 53.7)	<0.001
Hospital type				
Public hospital				
Private hospital	6.1	7.0	(-7.6, 19.9)	0.382
Hospital bed capacity (beds)				
Less than 61 beds				
61-133 beds	-1.7	7.5	(-16.4, 13.0)	0.819
134-287 beds	-0.4	6.8	(-13.8, 13.0)	0.951
More than 287 beds	3.2	8.4	(-13.2, 19.6)	0.702
Patient's overall health rating				
Excellent				
Very good	-1.0	0.6	(-2.2, 0.2)	0.107
Good	-4.1	0.8	(-5.7, -2.6)	<0.001
Fair	-6.2	1.3	(-8.6, -3.7)	<0.001
Poor	-16.5	5.2	(-26.6, -6.3)	0.001
Age (years)				
18-24 years				
25-34 years	0.1	0.8	(-1.5, 1.6)	0.936
35-44 years	0.7	0.9	(-1.0, 2.3)	0.433
45-54 years	-0.9	1.0	(-2.7, 1.0)	0.361
55-64 years	0.3	1.2	(-2.0, 2.6)	0.806
65-74 years	1.4	1.7	(-2.0, 4.8)	0.419
75 years or older	2.9	3.6	(-4.1, 9.8)	0.423
Gender				
Female				
Male	-1.9	0.5	(-2.8, -0.9)	<0.001
Education level				
Elementary level				
Preparatory level	1.1	1.6	(-2.0, 4.3)	0.481
Secondary level	2.8	1.2	(0.5, 5.1)	0.018
University graduate	2.9	1.2	(0.6, 5.2)	0.013
Postgraduate	2.4	1.4	(-0.4, 5.1)	0.093
Nationality				
Non-Qatari				
Qatari	-0.9	0.6	(-2, 0.3)	0.131

Parameters	Recommendation of Hospital			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Patient experience domains and items				
Communication with nurses	0.15	0.03	(0.1, 0.2)	<0.001
Communication with doctors	0.13	0.03	(0.1, 0.2)	<0.001
Responsiveness of hospital staff	0.03	0.01	(0.01, 0.1)	0.016
Pain management	0.04	0.02	(0.01, 0.1)	0.016
Communication about medicine	0.07	0.01	(0.05, 0.1)	<0.001
Discharge information	0.03	0.01	(0.004, 0.1)	0.019
Cleanliness of hospital environment	0.05	0.01	(0.03, 0.1)	<0.001
Quietness of hospital environment	0.03	0.01	(0.01, 0.1)	0.013

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

4.4 Association of Hospital-Level and Patient-Level Predictors with HCAHPS Domains and Individual Items

The average scores for HCAHPS domains and individual items were as follows: communication with doctors (92.1%), communication with nurses (91.8%), responsiveness of staff (87.7%), pain management (87.4%), cleanliness of hospital environment (87.0%), communication about medication (84.4%), quietness of hospital environment (83.4%), and discharge information (74.2%). Tables 7-14 summarize statistically significant adjusted associations between predictor variables with HCAHPS domains and individual items (detailed associations between predictors and each outcome are presented in appendix E to appendix L).

4.4.1. Association of Hospital-Level and Patient-Level Predictors with Communication with Nurses

Hospital bed capacity and gender were the only statistically significant predictors of communication with nurses. Hospitals with bed capacity of 134-287 beds and more than 287 beds had lower communication with nurses scores by 20.6% (95%

CI 7.5, 33.6) and 24.9% (95% CI 8.0, 41.8) as compared with hospitals with bed capacity of less than 61 beds, respectively. Male patients had lower communication with nurses scores than females (1.1%, 95% CI 0.5, 1.7); see table 7 and appendix E.

Table 7. Adjusted Associations Between Hospital-Level, Patient-Level Variables and HIE Domains with Communication with Nurses in Multivariable Multilevel Regression

Parameters	Communication with Nurses			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-10.8	8.9	(-28.4, 6.7)	0.225
134-287 beds	-20.6	6.7	(-33.6, -7.5)	0.002
More than 287 beds	-24.9	8.6	(-41.8, -7.9)	0.004
Gender				
Female	Ref			
Male	-1.1	0.3	(-1.7, -0.5)	<0.001
Patient experience domains and items				
Communication with doctors	0.4	0.02	(0.3, 0.4)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Pain management	0.1	0.01	(0.1, 0.1)	<0.001
Communication about medicine	0.0	0.01	(0.02, 0.1)	<0.001
Cleanliness of hospital environment	0.1	0.01	(0.1, 0.1)	<0.001
Quietness of hospital environment	0.0	0.01	(0.005, 0.03)	0.009

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

4.4.2. Association of Hospital-Level and Patient-Level Predictors with Communication with Doctors

Hospital bed capacity, gender, and education level were the statistically significant predictors of communication with doctors' scores. Increasing hospital bed capacity was associated with lower communication with doctors' scores. For example,

hospitals with more than 287 beds had lower communication with doctors' score by 13.1% (95% CI 3.0, 23.3) than hospitals with bed capacity of less than 61 beds. Male patients had lower communication with doctor scare by 0.8% (95% CI 0.3, 1.4) than female patients. University graduate and postgraduate patients had higher communication with doctors' scores by 1.6% (95% CI 0.5, 2.7) and 1.8% (95% CI 0.6, 2.9) than patients with elementary education level, respectively (table 8 and appendix F).

Table 8. Adjusted Associations Between Hospital-Level, Patient-Level Variables and HIE Domains with Doctors in Multivariable Multilevel Regression

Parameters	Communication with Doctors			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-27.5	4.9	(-37.2, -17.8)	<0.001
134-287 beds	-20.9	5.9	(-32.5, -9.2)	<0.001
More than 287 beds	-13.1	5.2	(-23.3, -3.0)	0.011
Gender				
Female	Ref			
Male	-0.8	0.3	(-1.4, -0.3)	0.004
Education level				
Elementary level				
Preparatory level	-0.5	0.9	(-2.3, 1.3)	0.579
Secondary level	0.6	0.5	(-0.5, 1.7)	0.275
University graduate	1.6	0.6	(0.5, 2.7)	0.005
Postgraduate	1.8	0.6	(0.6, 2.9)	0.002
Patient experience domains and items				
Communication with nurses	0.41	0.02	(0.4, 0.5)	<0.001
Responsiveness of hospital staff	0.05	0.01	(0.03, 0.1)	<0.001
Pain management	0.07	0.01	(0.05, 0.1)	<0.001
Communication about medicine	0.07	0.01	(0.1, 0.1)	<0.001
Cleanliness of hospital environment	0.04	0.01	(0.03, 0.1)	<0.001
Quietness of hospital environment	0.04	0.01	(0.03, 0.1)	<0.001

Ref: Reference category SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

4.4.3. Association of Hospital-Level and Patient-Level Predictors with Responsiveness of Hospital Staff

Patient's overall health rating and age groups were the only statistically significant predictors of scores of responsiveness of hospital staff. Patients rating their overall health as good and fair gave higher scores for staff responsiveness than those reporting excellent overall health by 1.8% (95% CI 0.7, 3.3) and 2.1% (95% CI 0.2, 3.9), respectively. Patients older than 75 years was the only age group, which had statistically significant difference in staff responsiveness rating score as compared to patients aged 18-24 years (7.2%; 95% CI 0.4, 13.9); (table 9 and appendix G).

Table 9. Adjusted Associations Between Hospital-Level, Patient-Level Variables and HIE Domains with Responsiveness of Hospital Staff in Multivariable Multilevel Regression

Parameters	Responsiveness of Hospital Staff			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Patient's overall health rating				
Excellent	Ref			
Very good	0.5	0.5	(-0.4, 1.6)	0.296
Good	1.8	0.6	(0.7, 3.3)	0.002
Fair	2.1	1.0	(0.2, 3.9)	0.031
Poor	0.5	3.1	(-5.6, 6.3)	0.869
Age (years)				
18-24 years	Ref			
25-34 years	-0.2	0.8	(-1.8, 1.4)	0.796
35-44 years	-0.8	0.9	(-2.5, 0.9)	0.397
45-54 years	0.4	1.0	(-1.5, 2.3)	0.696
55-64 years	-1.3	1.1	(-3.5, 0.9)	0.236
65-74 years	-0.3	2.0	(-4.2, 3.5)	0.866
75 years or older	7.2	3.5	(0.4, 13.9)	0.038
Patient experience domains and items				
Communication with nurses	0.3	0.04	(0.3, 0.4)	<0.001
Communication with doctors	0.1	0.03	(0.1, 0.2)	<0.001
Pain management	0.1	0.02	(0.1, 0.2)	<0.001
Communication about medicine	0.1	0.01	(0.1, 0.1)	<0.001
Discharge information	0.0	0.01	(<0.001, 0.03)	0.040
Cleanliness of hospital environment	0.1	0.01	(0.04, 0.1)	<0.001
Quietness of hospital environment	0.1	0.01	(0.02, 0.1)	<0.001

Ref: Reference category, SE†: Standard error (Bootstrap), 95% CI‡: 95% Confidence interval (Bootstrap)

4.4.4. Association of Hospital-Level and Patient-Level Predictors with Pain Management

There was a statistically significant linear relationship between patient's overall health rating and pain management scores (table 10 and appendix H). Patients with over health rating of very good and poor overall health had lower pain management scores than those reporting excellent overall health by 2.0% (95% CI 0.9, 2.9) and 7.5% (95% CI 1.0, 13.9), respectively.

Table 10. Adjusted Associations Between Hospital-Level, Patient-Level Variables and HIE Domains with Pain Management in Multivariable Multilevel Regression

Parameters	Pain Management			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Patient's overall health rating				
Excellent	Ref			
Very good	-2.0	0.5	(-2.9, -0.9)	<0.001
Good	-4.1	0.6	(-5.2, -2.9)	<0.001
Fair	-5.5	0.9	(-7.3, -3.6)	<0.001
Poor	-7.5	3.3	(-13.9, -1.0)	0.023
Patient experience domains and items				
Communication with nurses	0.2	0.03	(0.2, 0.3)	<0.001
Communication with doctors	0.1	0.03	(0.1, 0.2)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Communication about medicine	0.2	0.02	(0.1, 0.2)	<0.001
Discharge information	0.0	0.01	(0.02, 0.1)	<0.001
Cleanliness of hospital environment	0.0	0.01	(0.02, 0.1)	0.001
Quietness of hospital environment	0.1	0.01	(0.1, 0.1)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

4.4.5. Association of Hospital-Level and Patient-Level Predictors with Communication about Medicine

Hospital bed capacity and patient's overall health rating were the only statistically significant predictors of communication about medicine scores. Hospitals with bed capacity of 134-287 beds and more than 287 beds had lower scores of communications about medicine by 21.5% (95% CI 1.3, 41.7) and 26.2% (95% CI 5.0, 47.4) as compared with hospitals with bed capacity of less than 61 beds, respectively. In addition, there was a statistically significant linear relationship between patient's overall health rating and communication about medicine scores. Those patients rating their overall health as very good and poor had lower communication about medicine scores than those rating their overall health as excellent by 2.7% (95% CI 1.5, 3.9) and 15.5% (95% CI 1.7, 29.4), respectively (see table 11 and appendix I).

Table 11. Adjusted Associations Between Hospital-Level, Patient-Level Variables and HIE Domains with Communication about Medicine in Multivariable Multilevel Regression

Parameters	Communication about Medicine			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-12.1	10.4	(-32.5, 8.2)	0.243
134-287 beds	-21.5	10.3	(-41.7, -1.3)	0.037
More than 287 beds	-26.2	10.8	(-47.4, -5.0)	0.015
Patient's overall health rating				
Excellent	Ref			
Very good	-2.7	0.6	(-3.9, -1.5)	<0.001
Good	-2.2	0.7	(-3.6, -0.9)	0.001
Fair	-3.6	1.2	(-5.9, -1.3)	0.002
Poor	-15.5	7.1	(-29.4, -1.7)	0.028

Parameters	Communication about Medicine			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Patient experience domains and items				
Communication with nurses	0.1	0.03	(0.1, 0.2)	<0.001
Communication with doctors	0.2	0.03	(0.2, 0.3)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Pain management	0.2	0.02	(0.2, 0.3)	<0.001
Discharge information	0.1	0.01	(0.1, 0.1)	<0.001
Cleanliness of hospital environment	0.1	0.02	(0.04, 0.1)	<0.001
Quietness of hospital environment	0.1	0.01	(0.1, 0.1)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

4.4.6. Association of Hospital-Level and Patient-Level Predictors with Discharge Information

Hospital bed capacity, patient's overall health rating, age group, and education level were statistically significant predictors of discharge information scores. Hospitals with more than 287 beds had higher discharge information scores by 34.8% (95% CI 5.9, 63.6) than hospitals with bed capacity of less than 61 beds. In addition, there was a statistically significant linear relationship between patient's overall health rating categories with discharge information scores. As compared to patients reporting excellent overall health rating, those reporting very good and fair overall health had lower discharge information scores by 2.7% (95% CI 0.1, 5.2) and 6.5% (95% CI 2.6, 10.5), respectively. Patients in age groups of 35 to 64 years had higher discharge information scores than those aged 18-24 years. For instance, those aged 45-54 years had higher discharge information scores than those aged 18-24 years by 9.2% (95% CI 5.4, 12.9). Patients with postgraduate education level had higher discharge information

scores than those with elementary education level (5.6%, 95% CI 1.3, 9.9); (table 12 and appendix J).

4.4.7. Association of Hospital-Level and Patient-Level Predictors with Cleanliness of Hospital Environment

Patient's overall health rating, age group, education level, and nationality were statistically significant predictors of cleanliness of hospital environment scores. The strongest predictor of cleanliness of hospital environment scores was nationality. Qatari patients had lower cleanliness of hospital environment scores by 4.2% than non-Qatari patients (95% CI 2.6, 5.7); (table 13 and appendix K).

4.4.8. Association of Hospital-Level and Patient-Level Predictors with Quietness of Hospital Environment

Patient's overall health rating, age group, nationality, hospital bed capacity, and hospital type were statistically significant predictors of quietness of hospital environment scores. The strongest predictors of quietness of hospital environment scores were hospital bed capacity and hospital type (table 14 and appendix L). Hospitals with more than 287 beds had lower quietness of hospital environment scores by 27.3% than hospitals with less than 61 bed capacity (95% CI 9.2, 45.5).

Private hospitals had lower quietness of hospital environment scores by 15.2% (95% CI 2.7, 27.7) than public hospitals.

Table 12. Adjusted Associations Between Hospital-Level, Patient-Level Variables and HIE Domains with Discharge Information in Multivariable Multilevel Regression

Parameters	Discharge Information			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	27.3	14.0	(-0.1, 54.6)	0.051
134-287 beds	8.0	15.0	(-21.4, 37.4)	0.594
More than 287 beds	34.8	14.7	(5.9, 63.6)	0.018
Patient's overall health rating				
Excellent	Ref			
Very good	-2.7	1.3	(-5.2, -0.1)	0.039
Good	-5.0	1.1	(-7.3, -2.8)	<0.001
Fair	-6.5	2.0	(-10.5, -2.6)	0.001
Poor	-6.7	5.5	(-17.4, 4.0)	0.222
Age (years)				
18-24 years	Ref			
25-34 years	2.2	1.3	(-0.3, 4.8)	0.087
35-44 years	4.1	1.5	(1.2, 6.9)	0.005
45-54 years	9.2	1.9	(5.4, 12.9)	<0.001
55-64 years	5.8	1.9	(2.1, 9.6)	0.002
65-74 years	5.4	3.2	(-0.9, 11.6)	0.091
75 years or older	-7.8	6.7	(-20.9, 5.3)	0.241
Education level				
Elementary level	Ref			
Preparatory level	-2.0	1.9	(-5.6, 1.6)	0.283
Secondary level	-0.6	1.7	(-3.8, 2.7)	0.728
University graduate	3.0	1.5	(-0.1, 5.9)	0.056
Postgraduate	5.6	2.2	(1.3, 9.9)	0.010
Patient experience domains				
Responsiveness of hospital staff	0.05	0.02	(<0.001, 0.1)	0.049
Pain management	0.18	0.03	(0.1, 0.2)	<0.001
Communication about medicine	0.31	0.03	(0.3, 0.4)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Table 13. Adjusted Association Between Hospital-Level, Patient-Level Variables and HIE Domains with Cleanliness of Hospital Environment by Multivariable Multilevel Regression

Parameters	Cleanliness of Hospital Environment			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Patient's overall health rating				
Excellent	Ref			
Very good	-1.4	0.5	(-2.4, -0.4)	0.008
Good	-1.5	0.6	(-2.7, -0.4)	0.010
Fair	-2.1	0.9	(-3.8, -0.3)	0.024
Poor	2.2	3.6	(-5.0, 9.3)	0.555
Age (years)				
18-24 years	Ref			
25-34 years	-2.1	0.8	(-3.7, -0.6)	0.007
35-44 years	-1.2	0.7	(-2.6, 0.1)	0.062
45-54 years	-1.4	1.0	(-3.4, 0.6)	0.166
55-64 years	-0.4	0.9	(-2.2, 1.5)	0.700
65-74 years	-4.0	2.5	(-8.9, 0.9)	0.117
75 years or older	0.4	3.5	(-6.5, 7.2)	0.918
Education level				
Elementary level	Ref			
Preparatory level	-2.5	1.1	(-4.7, -0.4)	0.020
Secondary level	-0.2	0.7	(-1.6, 1.2)	0.769
University graduate	-0.6	0.7	(-1.9, 0.8)	0.405
Postgraduate	-0.8	1.0	(-2.8, 1.1)	0.395
Nationality				
Non-Qatari	Ref			
Qatari	-4.2	0.8	(-5.7, -2.6)	<0.001
Patient experience domains and item				
Communication with nurses	0.3	0.03	(0.2, 0.3)	<0.001
Communication with doctors	0.2	0.04	(0.1, 0.2)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Pain management	0.1	0.03	(0.02, 0.1)	0.009
Communication about medicine	0.1	0.02	(0.04, 0.1)	<0.001
Quietness of hospital environment	0.1	0.01	(0.1, 0.2)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Table 14. Adjusted Associations Between Hospital-Level, Patient-Level Variables and HIE Domains with Quietness of Hospital Environment in Multivariable Multilevel Regression

Parameters	Quietness of Hospital Environment			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Hospital type				
Public hospital	Ref			
Private hospital	-15.2	6.4	(-27.7, -2.7)	0.017
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-14.3	12.4	(-38.5, 9.9)	0.247
134-287 beds	-20.6	15.7	(-51.4, 10.2)	0.191
More than 287 beds	-27.3	9.3	(-45.5, -9.2)	0.003
Patient's overall health rating				
Excellent	Ref			
Very good	-1.0	0.4	(-1.9, -0.2)	0.020
Good	-1.6	1.1	(-3.8, 0.6)	0.159
Fair	-1.8	1.6	(-4.9, 1.3)	0.256
Poor	0.1	3.8	(-7.3, 7.5)	0.974
Age (years)				
18-24 years	Ref			
25-34 years	-0.1	1.0	(-1.9, 1.9)	0.958
35-44 years	-1.6	1.1	(-3.7, 0.4)	0.122
45-54 years	-0.1	0.5	(-1.0, 0.8)	0.790
55-64 years	1.3	0.3	(0.8, 1.9)	<0.001
65-74 years	-0.6	2.0	(-4.4, 3.3)	0.780
75 years or older	-9.4	5.4	(-19.9, 1.2)	0.082
Nationality				
Non-Qatari	Ref			
Qatari	-1.0	0.4	(-1.7, -0.2)	0.018
Patient experience domains and items				
Communication with nurses	0.1	0.04	(0.01, 0.2)	0.032
Communication with doctors	0.2	0.03	(0.1, 0.2)	<0.001
Responsiveness of hospital staff	0.1	0.02	(0.03, 0.1)	0.001
Pain management	0.1	0.01	(0.1, 0.2)	<0.001
Communication about medicine	0.1	0.00	(0.1, 0.1)	<0.001
Cleanliness of hospital environment	0.2	0.01	(0.2, 0.2)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

4.5 Trend of Overall Hospital Rating, Recommendation of Hospital to Family and Friends, and HCAHPS Domains and Items

As shown in figures 1 to 10, the majority of HCAHPS domains and individual items scores were relatively similar in magnitude between April 2017 and 2019, inclusive (figures 1 to 10). Table 15 presents the statistical significance of HCAHPS domains and individual items scores trends in all hospitals as well as according to hospital type. There was a statistically significant increase in overall hospital rating for all hospital (range 87.7% to 88.6%; F= 7.3; p= 0.007). However, this was statistically significant only for private hospitals (range 87.8% to 90.3%; F= 22.1; p= <0.001). Similarly, the overall trend for hospital rating increase by 1.1% for all hospital (range 87.6% to 88.7), which statistically significant (F= 8.5; p= 0.004). However, this was statistically significant only for private hospitals (F= 69.9; p= 0.001); see table 15. There was statistically significant decrease in trends of communication with nurses and doctors' domains in all hospitals with a range of (92.7% to 89.4%; F= 103.3; p= <0.001) and (93.2% to 90.1%; F= 94.3; p= <0.001), respectively. This trend remained statistically significant for both public and private hospitals (table 15). The overall trend of responsiveness of hospital staff decrease for all hospitals from 88.0% to 86.6% (F= 10.9; p= 0.001). However, this decline in responsiveness of hospital staff domain scores was statically significant only for public hospitals (range 85.8% to 84.6%; F= 4.6; p= 0.033); see table 15 and figure 5. There was no statistically significant change in trends in pain management scores for all hospitals (range 87.1% to 97.4%; F= 0.2; p= 0.623) or by hospital type (table 15 and figure 6). There was statistically significant increase in trends of communication about medicine domain scores for all hospitals (range 82.5% to 85.6%; F= 26.1; p= <0.001), which remained statistically significant increase for both public and private hospitals (table 15 and figure 7). Similarly, there was statistically

significant increase in trends of discharge information scores for all hospitals (range 70.8% to 80.8%; F= 137.7; p= <0.001), which remained statistically significant for public and private hospitals (table 15 and figure 8). Additionally, a statistically significant decrease in trends of cleanliness of hospital environment scores for all hospitals was observed (range 88.4% to 85.4%; F= 41.0; p= <0.001), which was also statistically significant decrease for public and private hospitals (table 15 and figure 9). Finally, there was a statically significant increase in quietness of hospital environment scores in all hospitals from 82.1% to 83.2% (F= 4.6; p= 0.032). However, this overall slight increase in quietness of hospital environment scores was not statistically significant in public hospitals (range 80.9% to 82.1%, F= 3.8; p= 0.051) or private hospitals (range 84.6% to 86.5%; F= 3.8; p= 0.053). Appendix M includes the unadjusted HCAHPS scores by survey year and hospital type.

Table 15. Trends for HIE Domains and hospital-environment scores in all hospitals and by hospital type 2017-2019, inclusive

	All Hospitals		Public Hospitals		Private Hospitals	
Patient experience domains and items	F Statistic	*P*-Value	F Statistic	*P*-Value	F Statistic	*P*-Value
Overall rating of hospital	7.3	0.007	0.6	0.432	21.2	<0.001
Recommendation of hospital	8.5	0.004	0.3	0.562	69.9	0.001
Communication with nurses	103.3	<0.001	55.9	<0.001	32.8	<0.001
Communication with doctors	94.3	<0.001	50.2	<0.001	30.1	<0.001
Responsiveness of hospital staff	10.9	0.001	4.6	0.033	0.1	0.745
Pain management	0.24	0.623	2.4	0.125	0.1	0.823
Communication about medicine	26.1	<0.001	7.0	0.008	31.0	<0.001
Discharge information	137.7	<0.001	48.5	0.001	105.4	<0.001
Cleanliness of hospital environment	41.0	<0.001	30.2	<0.001	3.1	0.077
Quietness of hospital environment	4.6	0.032	3.8	0.051	3.8	0.053

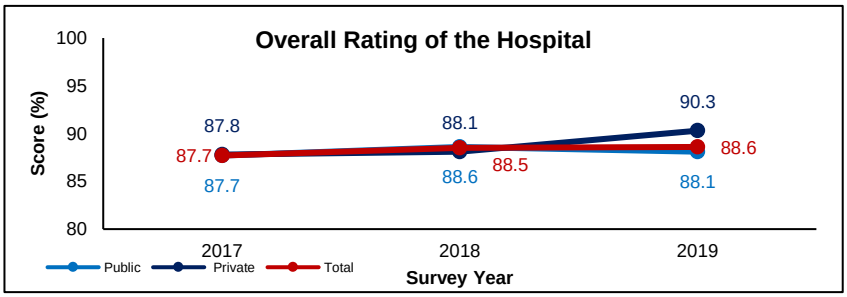

Figure 1. Overall rating of the hospital mean scores by survey year.

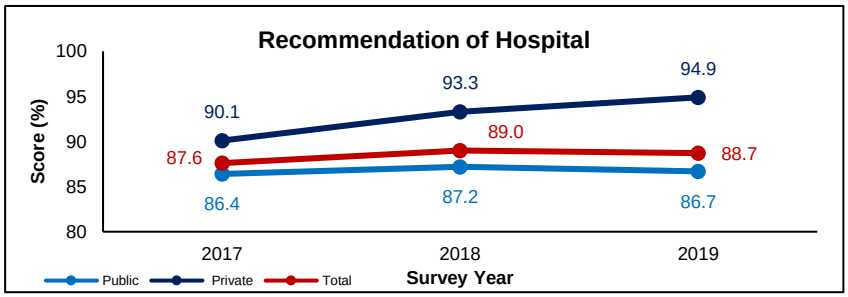

Figure 2. Recommendation of the hospital mean scores by survey year.

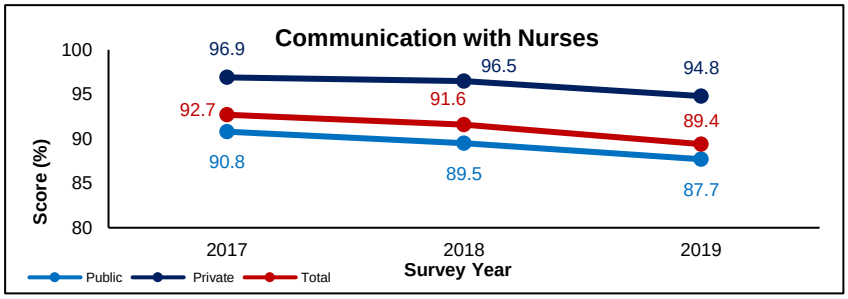

Figure 3. Communication with the nurse mean scores by survey year.

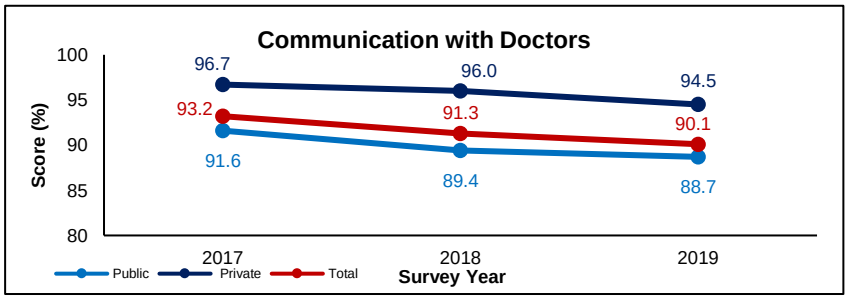

Figure 4. Communication with the doctors mean scores by survey year.

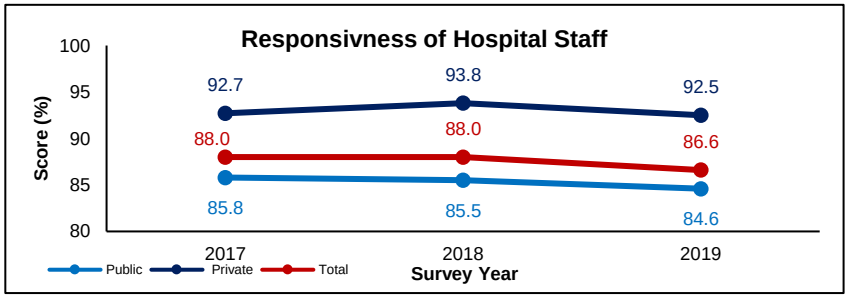

Figure 5. Responsiveness of hospital staff scores by survey year.

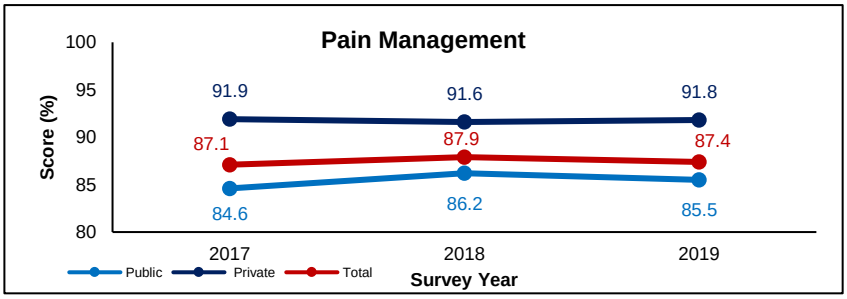

Figure 6. Pain management mean scores by survey year.

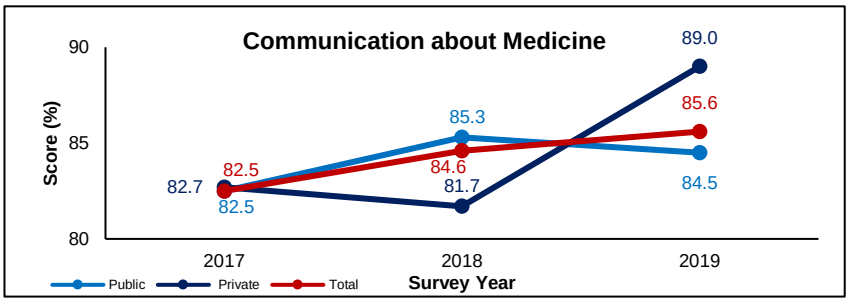

Figure 7. Communication about medicine mean scores by survey year.

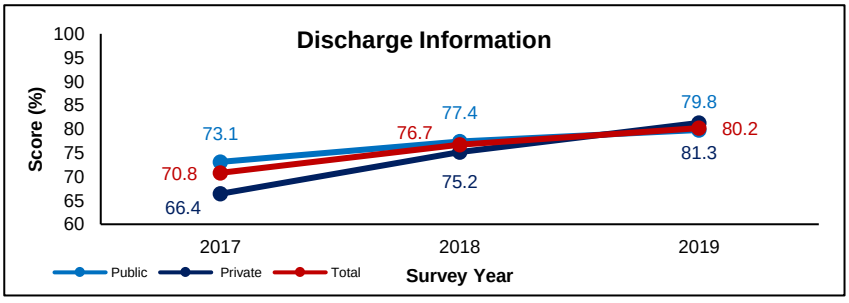

Figure 8. Discharge information mean scores by survey year.

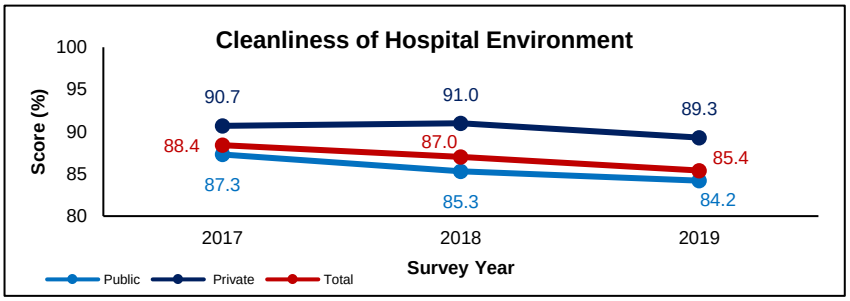

Figure 9. Cleanliness of hospital environment mean scores by survey year.

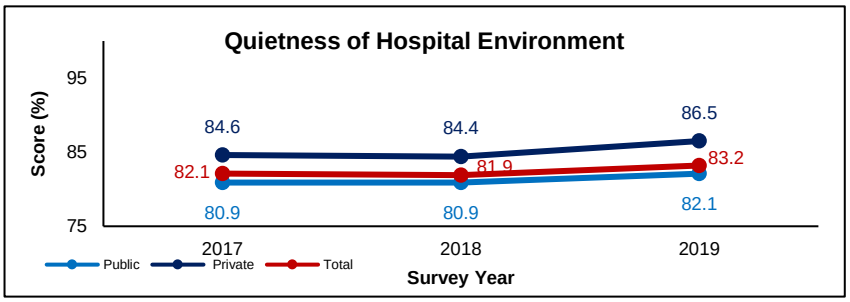

Figure 10. Quietness of hospital environment mean scores by survey year.

Chapter 5: Discussion

5.1. Summary and Interpretation of Findings with Comparisons to Previous Studies

The main aim of this study was to assess the overall HIE in the State of Qatar and identify associated factors using the HCAHPS tool from April 2017 to 2019 inclusive. The objectives were to identify the associations between the predictors and overall rating of the hospital and willingness to recommend the hospital, to describe the average national scores for HCAHPS domains and assessing their main predictors, finally to explore the domain's trend from 2017 to 2019.

The national average for overall hospital rating was 88.9% and the national average for willingness to recommend the hospital to family and friends was 89.0% for the study period. Both outcomes were very similar in their average scores and the results were comparable to previous studies, which had shown a significant correlation between overall hospital rating and recommendation of hospital. Studies by Chatterjee et al., (2012) and Jha et al., (2008) found high level of correlations between overall hospital rating and hospital recommendation were highly correlated (r=0.87). A patient experience survey was conducted in March 2017 involving 342 inpatients in a main pubic hospital in Qatar reveled that overall patient experience was rated as excellent by 59% of respondents and 23% as very good (Hamad Medical Corporation [HMC], 2017).

Mainly, communication with nurses and doctors had influenced the overall hospital rating. Prior studies showed that doctor-patient communication not only impact the clinical outcomes but also had a great role in influencing the overall hospital rating (Doyle et al., 2014; O'Malley et al., 2005). Also, engaged nurses are more likely to provide better patient care leading to better overall patient experience (Dempsey, Reilly & Buhlman, 2014). The high effect of doctors and nurse's communication on the overall

hospital rating could be explained by the fact that doctors lead the healthcare teams and provide diagnosis along with treatment plans. In addition, the regular and close contact of inpatients with nurses during the hospitalization period could explain the higher rating of nurses compared and its relative importance as compared to other HCAHPS domains.

Pain management, communication about medicine and cleanliness of hospital environment domains had similar significant association with the main outcomes in the current study. Patient's view of pain and care provider's responsiveness in managing pain had a strong association with the overall patient experience (Hanna, González-Fernández, Barrett, Williams & Pronovost, 2015).

In the current study, the smallest association was between the predictors and the discharge information domain. Our findings are comparable to a study by Schoenfelder, Schaal, Klewer and Kugler (2014), where their study highlighted the importance of information after discharge, yet its association with overall patient experience was small in comparison to the other HCAHPS domains. Another study by Klinkenberg et al., (2011) found that discharge information domain was a significant predictor of patient's willingness to recommend the hospital, although the association was small compared to other domains included in their study such as communication with nurses, communication with doctors and cleanliness of hospital environment. Hachem, Canar, Ma, Gallan and Hohmann (2014) found high association between discharge information and recommendation of the hospital but concluded that patient who positively scored discharge information were mainly inpatients with higher risk of readmission. Recognizing patients with higher risk of readmission are more likely to receive extra care from the medical staff and more focused discharge plans, that may explain the high score of discharge information domain in their study.

Our findings showed that responsiveness of hospital staff domain was not a significant predictor of overall rating of the hospital, which is not consistent with the findings of other studies. For example, one study showed that staff responsiveness was highly correlated with overall hospital rating (Kemp et al., 2015). However, this could be explained by differences in statistical methods and adjustment for important predictors in our study. Similarly, Other patient-level predictors such as age, gender and education level along with hospital characteristics as bed capacity and hospital type were not statistically significant predictors of overall rating of the hospital (Rahmqvist, 2001; Schoenfelder, 2014).

Patient's self-reported overall health rating and nationality were the only patient related characteristics significantly associated with overall hospital rating. Hall, Milburn and Epstein (1993) explored the relationship between overall health status and patient experience and found a strong evidence that health status is a strong predictor of patient experience, although they did not exclude the possibility that doctors could intercede the effect of satisfaction.

Likewise, recommendation of hospital to family and friends was significantly associated with all HCAHPS domains. Again, communication with nurses and doctors had the highest significant association on willingness to recommend the hospital. Responsiveness of hospital staff, discharge information and quietness of hospital had similar and weaker associations with hospital recommendation scores (Jha et al., 2008). Patient's overall health rating and gender were associated with the hospital recommendation, whereas age, educational level and nationality had no significant associations (Weidemann, Schönfelder, Klewer & Kugler, 2015). Similar to overall hospital rating, hospital level characteristics were not significant predictors for the

willingness to recommend the hospital, which agrees with findings of the study by Schoenfelder (2014).

On average 92% of adult inpatients were satisfied with their communication with nurses and doctors. Both domains were associated with other HCAHPS domains except for discharge information. Moreover, all hospital-level and patient-level predictors were not statistically significant predictors of both communication with nurses and doctors domains' excluding gender.

HCAHPS domains and the two hospital-environment items' scores were significantly associated with responsiveness of staff, although discharge information showed very marginal significance. Moreover, none of patient or hospital-level characteristics seemed to be significant predictors of responsiveness of staff domain.

HCAHPS domains and self-reported overall health rating were significantly associated with pain management and communication about medicine domains.

Discharge information showed diverse association compared to HCAHPS domains, it was associated only with pain management and communication about medicine domains, but no significant associations were observed between patient or hospital-level characteristics with discharge information scores.

Regarding the individual items, overall health rating and nationality were significant predictors for cleanliness of hospital environment, where nationality and hospital type were significantly associated with quietness of hospital environment.

In our study, communication with nurses and doctors were the main drivers for the global measures of the overall inpatient experience compared to the rest of HCAHPS domains. Most studies presented positive and high association between the communication domains and patient experience scores. That could be explained by the effective communication with patients during the hospitalization period is essential to

improve patients' perception of their overall care. Research presented that engaged and responsive healthcare professionals are expected to provide better quality of care which concurrently improve patient's adherence to treatment plans and grant better clinical outcomes (Aiken, Clarke, Sloane, Lake & Cheney, 2009; Aiken et al., 2012; Stimpfel, Sloane, McHugh & Aiken, 2016).

Although hospital characteristics didn't hold any significance in predicting patient experience in our study, the result presented higher satisfactions with smaller hospitals rather than larger ones. The results were similar to other studies found hospital size constantly associated with higher patient experience scores (Ford, Huerta, Diana, Swanson & Menachemi, 2013; McFarland, Shen, Parker & Meyerson, 2017; McFarland, Ornstein & Holcombe, 2015). Non- profit hospitals were significant predictors in many studies where it presented higher patient's experience (Ford et al., 2013, Jha et al., 2008; Tajeu, Kazley & Menachemi, 2015). However, our findings and those of Schoenfelder (2014) study showed that inpatients were more satisfied with private hospitals as compared to public hospitals. This could be explained by the personalized health care and the environment of private hospitals, which may attract and influence patients' perception of care and related satisfaction (Kazley, Ford, Diana & Menachemi, 2015).

With regards to patient characteristics, other studies showed significant associations between age and gender with patient experience. Older patients and females were less satisfied with their hospitalization experience (Elliott et al., 2012). Additionally, a study by Otani and colleagues (2012) that age and gender were not associated with patient satisfaction. However, this is not consistent with our findings that older inpatients and females were much satisfied than younger inpatients and males. Studies conducted in Saudi Arabia by Al-Doghaither (2004) and Binsalih, Waness,

Tamim, Harakati, & Sayyari, (2011) had similar results to our findings, the studies showed that females and patients older than 50 years rated their satisfaction more than men and younger patients. This could be explained by the greater courtesy and respect that given to females than male in public and social circumstances, also, it could be that hospital staff acted in accordance with the cultural norms and etiquette providing more respect and empathy towards female patients (Al-Doghaither, 2004; Binsalih et al., 2011). It is also possible that females in our societies learn to expect less; therefore, they are more satisfied with the health services provided compared to men. Younger and male inpatients may have unrealistic or higher expectations from their healthcare, perhaps having exposure to healthcare outside the country making them more critical to the services provided which might explain our finding.

Our results are consistent with other studies showing inpatients with poorer health statues were always less satisfied with their hospital care (Elliott et al., 2012; Otani et al., 2012). Much healthier patients might be more satisfied in their life and that reflects on their satisfaction with the hospital care.

Results of assessing patient experience related to patient and hospital characteristics in a study from seven hospitals in Riyadh, Saudi Arabia, found that the mode of payment of hospital care and patient's education level had a significant influence on patient satisfaction level (Alaiban et al., 2003). Patients who depends on their resources to pay for the care were dissatisfied with most of the private hospital services. Moreover, patients with more years of education tended to be more satisfied with the doctors and the cleanliness of the hospital environment. In addition, patient's overall health status and gender were not significantly associated with overall patient experience (Alaiban et al., 2003),

Generally, ethnic groups and minority racial inpatients had lower scores for patient experience (Craig et al., 2015; Day et al., 2014; Otani, Herrmann & Kurz, 2010). Nationality in our analysis was categorized into Qatari and non-Qatari inpatients, thus, we didn't explore inpatient experience according ethnic groups because this data was not collected in the survey. However, the current study showed that Qatari patients were less satisfied with their hospital experience as compared to other nationalities. It could be that inpatients with different racial backgrounds and socioeconomic characteristics may have different expectations from their healthcare providers. Our findings are consistent with a cross-cultural study in Qatar, which evaluated the effect of citizenship on service utilization and general satisfaction with the healthcare (Khaled, Shockley & Abdul Rahim, 2017). In the study, Qatari patients were significantly less likely to be satisfied with the healthcare services compared to the non-Qatari patients, and these differences could be larger due to the unmet expectations of the Qatari nationals. The study also found that non-Qatari patients who were born in Qatar had a higher satisfaction compared to Qatari, but lower satisfaction compared to non-Qatari born outside Qatar, which supports the theory that the expectations related to national context drive the satisfaction with the healthcare (Khaled, Shockley & Abdul Rahim, 2017). Therefore, more research is needed to examine whether inpatient experience reflect differences in patients' expectations and values or significant variations in the way inpatients were treated (Lyratzopoulos et al., 2012).

The associations between the HCAHPS domains and individual items with the hospital and patient characteristics in our study were not very similar to other studies. Most of the studies showed significant association rather than no association. For example, age and education level were not significant patient-level predictors for HCAHPS domains and individual items. Females were significantly more satisfied with

almost all the domains compared to male. Hospital type was not a significant predictor, although private hospitals had higher influence on the HCAHPS domains, and the individual items compared to public hospitals. The variation could be explained by the combination of variables included in the other studies and the choice of statistical methods.

The current study showed increase in overall hospital rating and hospital recommendation scores from 2017 to 2019. The majority of HCAHPS domains and individual items' scores also increased during the same period. In addition, private hospitals showed higher HCAHPS scores in comparison to public hospitals during the study period. This suggests improvements in the quality of healthcare in relation to some HCAHPS domains. We are not aware of any other studies that assessed trends in the HCAHPS global items, domains, and individual items over time.

5.2. Strength and Limitations

The main strength of our study is in being the first study done on a national level and the study sample included all public hospitals and main private hospitals in Qatar. The HIE was measured using the HCAHPS, which is a validated survey tool to measure HIE. The survey data was collected in standardized method and contained a large sample size from April 2017 to 2019, inclusive. In addition, the use of multivariable multilevel modelling methods enabled us to identify the independent hospital-level and patient-level predictors to HIE. The majority of previous studies were limited by not using multilevel modelling methods to account for between hospital variations in patient-characteristics.

Our study has several limitations, self-reporting of the surveys from the hospitals was one of the main challenges. We cannot assure hospital compliance with the sampling protocol while selecting the patients to fill the survey, therefore we cannot

exclude selection bias. Mode of survey could be another limitation of the study. Inpatients are requested to fill the survey before their hospital discharge, which could force patients to hide their dissatisfaction with the hospital, and thus provide more positive responses (Dorieke et al., 2009; Godden, Paseka, Gnida & Inguanzo, 2019). This might alter the overall patient experience and bias it towards higher scores. For instance, a pilot study showed that telephone survey modes had more positive responses compared to mail surveys indicating the potential bias associated with survey mode (Kemp et al., 2015). HCAHPS Update Training Report ([CMS], 2017) recommends using mixed survey methods to measure HIE. The report states that mail only mode showed a sharp decline in response rate from 2012 to 2016 while telephone method showed steadier drop in response rate during same period. According to Godeen et al., (2019) obtaining representative sample size is key to capture more accurate HCAHPS scores. In our study, all surveys were completed by patients before their discharge from hospitals, also the dataset didn't include the response rate for each hospital neither the total number of discharges during the survey period to permit estimation of response rates. Therefore, we had no information on the response rate of the survey. Another limitation was survey language. The survey was distributed and completed either in Arabic or English languages, which introduces selection bias as the survey does not include those who do not speak Arabic or English. The extent of this selection bias is not clear because we have no information on proportions of inpatients who do not speak Arabic or English. A study by McFarland, Shen and Holcombe (2016) reported that the linguistic status of patients associated with lower patient satisfaction. Excluding these patients from our study could introduce selection bias and may have a negative impact on the study outcomes (Dunlap et al., 2015). Our study is also limited by the lack of information on important factors affecting HIE such as comorbidities and severity of

health conditions of respondents, which is not captured in the HIE survey. However, self-reported overall health rating may be a proxy measure for other factors associated with HIE, such as severity of illness, disabilities and comorbidities, other predictors such as length of stay, type of hospital admission, hospital affiliation with other institutes and organizational culture (Hanson et al., 2018). Content validity was tested for different patient experience survey tools including HCAHPS in Beattie et al. systematic review (2015) by examining which part of hospital quality care mattered most to patients. The content validity of HCAHPS was rated as poor as no information was provided to determine whether aspects of quality recommended by patients had been integrated within the instrument, as well as patients having coincided with pre-determined items. Adding a free text in the survey to report patient's opinion may give the patient an option to report important information related to other aspects of hospital care which might not been included in the instrument and provide an opportunity to assess and improve patient experience much further. Involving patients in focus groups and encourage them to participate as advisors in projects or initiatives linked to their health, will transform patient's involvement from being a passive consumer of health services to have more active role as an effective partner in shaping the quality and safety of the healthcare (Greaves, Ramirez-Cano, Millett, Darzi, & Donaldson, 2013; Sofaer et al., 2005; The Health Foundation, 2013).

One more limitation is that the findings need to be interpreted with caution about the observed associations in the study because the direction of associations cannot be established in cross-sectional studies. In addition, potential endogeneity between participants' health status and HCHAPS domains is an important potential limitation, which has not been examined in this thesis.

Another potential limitation is that the author converted Likert type data in the HCHAPS using normalized scores and the data was modelled using mixed linear regression, and as different scaling patterns may result in different regression outcomes within the Ordinary Least Squares (OLS) framework, the results, especially the magnitude of effect of each variable, should be interpreted with caution.

Finally, no interactions between the domains and hospital or patient characteristics were examined in our study. Considering the complexity of the statistical methods we used (multivariable multilevel modelling with bootstrapping and including large number of patient-level variables as random effects), STATA and SAP statistical packages were not capable to handle the complexity of our models by including additional parameters for interactions (analysis outcomes did not converge after running the analysis for several hours).

5.3. Implications for Healthcare Quality Improvement and Future Research

The Qatari NHS 2018- 2022 has five system-wide priorities, one of the priorities is to achieve an integrated model of high-quality care and service delivery (NHS, 2018). In order to measure the progress in delivering an integrated healthcare service, targets and indicators were developed and implemented. Improving patient experience and engagement with the healthcare systems is an important outcome to monitor the progress in achieving these priorities. The results of this study provide a baseline measure for the HIE on a national level and highlights HIE domains and items that require close monitoring and improvements, which has important implications for future quality improvement projects. Future quality improvement projects should aim at improving communication about medicine, responsiveness of staff, and discharge information and quietness of hospital environment as these areas had the lowest overall hospital rating and recommendation. In addition, future research and quality improvement projects to

examine mechanisms underlying the observed associations between important predictors with overall hospital rating and recommendation such as patient's overall health rating, age, gender, education level and nationality. Moreover, the findings highlight important predictors of scores of the HCAHPS domains and items. Hospitals with higher bed capacities need to do more work to enhance communication with nurses and doctors' domains especially with male patients and those with lower education level. Responsiveness of staff is another domain that require close monitoring and improvement especially among younger age groups and those with lower patient's overall health rating. In addition, monitoring and quality improvement initiative should target factors associated with lower pain management scores (lower patient's overall health rating), lower communication about medicine scores (lower patient's overall health rating especially in hospitals with higher bed capacity), lower discharge information scores (younger age groups, lower education level, lower patient's overall health rating, and hospitals with higher bed capacity), lower scores on cleanliness of hospital environment (Qatari patients, lower patient's overall health rating, and hospitals with lower bed capacity), and lower scores on quietness of hospital environment (Qatari patients, private hospitals, and hospitals with lower bed capacity). Both public and private hospitals had decrease in scores on communication with nurses and doctors' domains and cleanliness of hospital environment over the study period. Therefore, it is important that these three important domains get close monitoring and identify the underlying reasons for this decline. Additionally, the findings have also other implications for public hospitals wishing to improve HIE. Public hospitals need more quality improvement work to enhance communication with nurses, communication with doctors, and discharge information scores.

This information is very useful for evaluating future interventions and highlights areas for improvement. The results of the HIE can be applied in various strategic plans such as national health insurance projects, where percentage of hospital's reimbursement may depend on HIE average scores. Public reporting of the HIE scores is another health strategic plan, aiming to provide transparency and build trust in the healthcare system through reporting selected quality and safety indicators. Auditing the process of conducting patient experience survey in healthcare facilities is another initiative that should be performed to improve the methods of conducting the survey such as mode of data collection.

The study can offer substantial implication on a hospital level. The results can be used to recognise the strengths and areas for improvement in healthcare delivery in relation to specific HCHAPS domains and items. Hospitals may prioritize quality improvement projects to focus on areas to further enhance HIE. Future research studies using the HCHAPS survey may wish to include other clinical and social characteristics of patients (e.g. commodities, severity of conditions, reason for admission, and ethnicity) to better understand the independent and important predictors of HIE and related potential impact on health outcomes.

5.4. Conclusion

This thesis assessed the overall HIE in the State of Qatar and identify associated factors using the HCAHPS from April 2017 to 2019 inclusive. The national average for overall hospital rating was 88.9% and the national average for willingness to recommend the hospital to family and friends was 89.0%. Both outcomes were comparable in their average scores and association with HCAHPS domains and individual items. Communication with doctors and nurses had the highest association with the overall hospital rating and recommendation of the hospital. Responsiveness of

hospital staff was the only HCAHPS domain, which didn't represent association with overall hospital rating. Patient-level and hospital-level predictors showed different association patterns. Patient's overall health rating was significant predictor of all HCAHPS domains and individual items excluding communication with nurses and communication with doctors' domains. The trend for overall hospital rating showed an increase from 2017 to 2019 (87.7% to 88.6%) and overall recommendation of the hospital raised from 87.6% in 2017 to 88.7% in 2019.

Improving patient experience and engagement with the healthcare system is an important outcome, which should be evaluated and monitored regularly to assess the progress in achieving the NHS 2018-2022 priorities for the State of Qatar. The findings of the thesis provide a baseline measure for the HIE on a national level and identified important factors associated with HIE. This information is helpful for planning and prioritizing national and hospital-level quality improvement projects targeting improvements in HIE.

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Appendices

Appendix A: Inpatient Experience Survey (English Version).

Ministry of Public Health
Patient Experience Survey for Hospitals- Inpatient

Facility Name:	**Survey ID Number:**
Date:	**Survey Status:**

- You should fill out this questionnaire only if you were the patient. You may get help from a family member or a friend to answer the questions.
- Answer **all** the questions by checking the box to the left of your answer.
- You are sometimes told to skip over some questions in this survey. When this happens, you will see an arrow with a note that tells you what question to answer next, like this:

☐ Yes
☐ No ➡ **If No, go to question (1)**

YOUR CARE FROM NURSE

1. **During your most recent hospital stay, how often did nurses treat you with courtesy and respect?**
   ☐ Never
   ☐ Sometimes
   ☐ Usually
   ☐ Always
   ☐ Missing/ Don't know
2. **During this hospital stay, how often did nurses listen carefully to you?**
   ☐ Never
   ☐ Sometimes
   ☐ Usually
   ☐ Always
   ☐ Missing/ Don't know
3. **During this hospital stay, how often did nurses explain things in a way you could understand?**
   ☐ Never
   ☐ Sometimes
   ☐ Usually
   ☐ Always
   ☐ Missing/ Don't know

YOUR CARE FROM DOCTORS

5. **During this hospital stay, how often did doctors treat you with courtesy and respect?**
   ☐ Never
   ☐ Sometimes
   ☐ Usually
   ☐ Always
   ☐ Missing/ Don't know
6. **During this hospital stay, how often did doctors listen carefully to you?**
   ☐ Never
   ☐ Sometimes
   ☐ Usually
   ☐ Always
   ☐ Missing/ Don't know
7. **During this hospital stay, how often did doctors explain things in a way you could understand?**
   ☐ Never
   ☐ Sometimes
   ☐ Usually
   ☐ Always
   ☐ Missing/ Don't know

4. **During this hospital stay, after you requested assistance, how often did you get help as soon as you wanted it?**
   - ☐ Never
   - ☐ Sometimes
   - ☐ Usually
   - ☐ Always
   - ☐ I never requested assistance
   - ☐ Missing/ Don't know

THE HOSPITAL ENVIRONMENT

8. **During this hospital stay, how often were your room and toilet kept clean?**
   - ☐ Never
   - ☐ Sometimes
   - ☐ Usually
   - ☐ Always
   - ☐ Missing/ Don't know

9. **During this hospital stay, how often was the area around your room quiet at night?**
   - ☐ Never
   - ☐ Sometimes
   - ☐ Usually
   - ☐ Always
   - ☐ Missing/ Don't know

YOUR EXPERIENCES AT THE HOSPITAL

10. **During this hospital stay, did you need help from nurses or other hospital staff in getting to the bathroom or in using a bedpan?**
    - ☐ Yes
    - ☐ No → **If No, Go to question (12)**
    - ☐ Missing/ Don't know → **Go to question (12)**

12. **During this hospital stay, did you need medicine for pain?**
    - ☐ Yes
    - ☐ No → **If No, Go to question (15)**
    - ☐ Missing/ Don't know → **Go to question (15)**

13. **During this hospital stay, how often was your pain well controlled?**
    - ☐ Never
    - ☐ Sometimes
    - ☐ Usually
    - ☐ Always
    - ☐ Not applicable
    - ☐ Missing/ Don't know

14. **During this hospital stay, how often did the hospital staff do everything they could to help you with your pain?**
    - ☐ Never
    - ☐ Sometimes
    - ☐ Usually
    - ☐ Always
    - ☐ Not applicable
    - ☐ Missing/ Don't know

11. **How often did you get help in getting to the bathroom or in using a bedpan as soon as you wanted?**

- ☐ Never
- ☐ Sometimes
- ☐ Usually
- ☐ Always
- ☐ Not applicable
- ☐ Missing/ Don't know

17. **Before giving you any new medicine, how often did hospital staff describe possible side effects in a way you could understand?**

- ☐ Never
- ☐ Sometimes
- ☐ Usually
- ☐ Always
- ☐ Not applicable
- ☐ Missing/ Don't know

DISCHARGE FROM THE HOSPITAL

18. **After leaving the hospital, will you go directly to your own home, to someone else's home, or to another health facility?**

- ☐ Own home
- ☐ Someone else's home
- ☐ Another health facility → **If another, go to question (21)**
- ☐ Missing/ Don't know → **Go to question (21)**

15. **During this hospital stay, were you given any medicine that you had not taken before?**

- ☐ Yes
- ☐ No → **If No, Go to question (18)**
- ☐ Missing/ Don't Know → **Go to question (18)**

16. **Before giving you any new medicine, how often did hospital staff tell you what the medicine was for?**

- ☐ Never
- ☐ Sometimes
- ☐ Usually
- ☐ Always
- ☐ Not applicable
- ☐ Missing/ Don't know

OVERALL RATING OF YOUR STAY AT THE HOSPITAL

21. **Using any number from (0) to (5), where (0) is the worst hospital possible and (5) is the best hospital possible, what number would you use to rate this hospital during your stay?**

- ☐ 0 - Worst hospital possible
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 - Best hospital possible
- ☐ Missing/ Don't know

22. **Would you recommend this hospital to your friends and family?**

- ☐ Definitely no
- ☐ Probably no
- ☐ Probably yes
- ☐ Definitely yes
- ☐ Missing/ Don't know

19. During this hospital stay, did doctors, nurses, or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?

- ☐ Yes
- ☐ No
- ☐ Not applicable
- ☐ Missing/ Don't know

20. During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?

- ☐ Yes
- ☐ No
- ☐ Not Applicable
- ☐ Missing/ Don't know

23. During this hospital stay, staff took my preferences and those of my family or caregiver into account in deciding what my health care needs would be when I left.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Agree
- ☐ Strongly agree
- ☐ Missing/ Don't know

24. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Agree
- ☐ Strongly agree
- ☐ Missing/ Don't know

25. When I left the hospital, I clearly understood the purpose for taking each of my medications.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Agree
- ☐ Strongly agree
- ☐ I was not given any medication when I left the hospital
- ☐ Missing/ Don't know

29. What is the highest grade or level of school that you have completed?

- ☐ Elementary level (primary education)
- ☐ Preparatory level (middle school education)
- ☐ Secondary level (secondary education)
- ☐ University graduate
- ☐ Postgraduate

ABOUT YOU

26. In general, how would you rate your overall health? Would you say that it is?

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Fair
- ☐ Poor
- ☐ Missing/ Don't know

27. What is your age?

- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65-74
- ☐ 75 or older

28. Are you male or female?

- ☐ Male
- ☐ Female

30. What is your country of origin?

- ☐ ----------

Please return the survey even if you did not answer all the questions.

Thank you for taking the time to answer this survey.

Appendix B: Inpatient Experience Survey (Arabic Version).

وزارة الصحة العامة

استبيان حول مدى رضا المرضى الداخليين بالمستشفيات

اسم المنشأة: **رقم الاستبيان:**

التاريخ: **حالة الاستبيان:**

الهدف من هذا الاستبيان:

الهدف من هذه الأسئلة هو تحسين الخدمات المقدمة في الأقسام الداخلية بالمستشفى. كل آرائكم واقتراحاتكم قيمة لنا. نأمل أن تمنحنا (5-10 دقائق) من وقتك للإجابة عن الأسئلة التالية لتقييم الخدمات التي تلقيتها خلال إقامتك بالمستشفى.

المعلومات ستكون سرية تماماً، ولن تكشف عن هوية المريض مع العلم بأن رفضك المشاركة في هذا الاستبيان لن يؤثر على العناية التي ستتلقاها في المستشفى.

قد يتحتم عليك أحياناً تخطي بعض الأسئلة في هذا الاستبيان، وفي هذه الحالة سترى سهماً مع ملاحظة تخبرك بالسؤال التالي الذي يجب عليك الإجابة عليه، كما هو موضح بالمثال التالي:

- ○ نعم
- ○ لا ⟸ **إذا كانت الإجابة (لا)، اذهب إلى السؤال رقم (1)**

الرجاء الإجابة على الأسئلة في هذا الاستبيان بشأن فترة اقامتك في المستشفى.

طاقم التمريض:

الأسئلة التالية تتعلق بالرعاية التي تلقيتها من طاقم التمريض

1. **خلال اقامتك في المستشفى، هل عاملك طاقم التمريض بلطف واحترام؟**
   - ○ أبداً
   - ○ أحياناً
   - ○ غالباً
   - ○ دائماً
   - ○ لا أعلم / امتنع عن الإجابة
2. **خلال اقامتك في المستشفى، ما مدى استماع طاقم التمريض لك بانتباه؟**
   - ○ أبداً
   - ○ أحياناً
   - ○ غالباً
   - ○ دائماً
   - ○ لا أعلم / امتنع عن الإجابة

3. **خلال اقامتك في المستشفى، هل قام طاقم التمريض بشرح الأمور لك بطريقة يسهل عليك فهمها؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا أعلم / امتنع عن الإجابة

الأطباء:

الأسئلة التالية تتعلق بالرعاية التي تلقيتها من الأطباء

5. **خلال اقامتك في المستشفى، هل عاملك الأطباء بلطف واحترام؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا أعلم / امتنع عن الإجابة

6. **خلال اقامتك في المستشفى، ما مدى استماع الأطباء لك بانتباه؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا أعلم / امتنع عن الإجابة

7. **خلال اقامتك في المستشفى، هل قام الأطباء بشرح الأمور لك بطريقة يسهل عليك فهمها؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا أعلم / امتنع عن الإجابة

4. **خلال اقامتك في المستشفى، وبعد ضغطك على زر النداء، كم مرة حصلت على المساعدة عند طلبها؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لم أضغط على زر النداء أبداً
- ○ لا أعلم / امتنع عن الإجابة

9. **خلال اقامتك في المستشفى، ما مدى هدوء المنطقة المحيطة بغرفتك ليلاً؟**

- ○ لم يكن هادئاً أبداً
- ○ هادئ أحياناً
- ○ هادئ غالباً
- ○ هادئ دائماً
- ○ لا أعلم / امتنع عن الإجابة

تجربتك الخاصة بالمستشفى:

الأسئلة التالية تتعلق بتجربتك خلال فترة إقامتك بالمستشفى

10. **خلال اقامتك في المستشفى، هل احتجت لطلب المساعدة من الممرضات أو أحد مقدمي الرعاية الصحية للوصول إلى دورات المياه أو استعمال القصرية؟**

- ○ نعم
- ○ لا ⟸ **إذا كانت الإجابة (لا)، اذهب إلى السؤال رقم (12)**
- ○ لا أعلم / امتنع عن الإجابة ⟸ **اذهب إلى السؤال رقم (12)**

بيئة المستشفى:

الأسئلة التالية تتعلق بغرفة المريض وأجواء المستشفى

8. **خلال اقامتك في المستشفى، الى أي مدى تم الحفاظ على نظافة غرفتك ودورة المياه؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا أعلم / امتنع عن الإجابة

13. **خلال اقامتك في المستشفى، ما مدى السيطرة على ألمك؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا ينطبق
- ○ لا أعلم / امتنع عن الإجابة

14. **خلال اقامتك في المستشفى، ما مدى الجهود المبذولة من مقدمي الرعاية الصحية لمساعدتك بخصوص ألمك؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا ينطبق
- ○ لا أعلم / امتنع عن الإجابة

11. **كم مرة تلقيت فيها المساعدة للانتقال لدورة المياه أو استعمال القصرية فور طلبها؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا ينطبق
- ○ لا أعلم / امتنع عن الإجابة

12. **خلال اقامتك في المستشفى، هل احتجت إلى أدوية للألم؟**

- ○ نعم
- ○ لا ⟸ **إذا كانت الإجابة (لا)، اذهب إلى السؤال رقم (15)**
- ○ لا أعلم / امتنع عن الإجابة ⟸ **اذهب إلى السؤال رقم (15)**

17. **قبل صرف أي أدوية جديدة لك، هل قام مقدمي الرعاية الصحية بشرح الاثار الجانبية المحتملة بطريقة يسهل عليك فهمها؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا ينطبق
- ○ لا أعلم / امتنع عن الإجابة

خروجك من المستشفى:

الأسئلة التالية تتعلق بإجراءات الخروج من المستشفى

18. **بعد خروجك من المستشفى، هل ستتوجه لمنزلك مباشرة، أو لمنزل شخص آخر، أو لمرفق صحي آخر؟**

- ○ منزلي
- ○ منزل شخص آخر
- ○ مرفق صحي آخر ⟸ **اذهب إلى السؤال رقم (21)**
- ○ لا أعلم / امتنع عن الإجابة ⟸ **اذهب إلى السؤال رقم (21)**

15. **خلال اقامتك في المستشفى، هل تم صرف أي أدوية لم يسبق لك أخذها؟**

- ○ نعم
- ○ لا ⟸ **إذا كانت الإجابة (لا)، اذهب إلى السؤال رقم (18)**
- ○ لا أعلم / امتنع عن الإجابة ⟸ **اذهب إلى السؤال رقم (18)**

16. **قبل اعطائك أي أدوية جديدة، هل قام مقدمي الرعاية الصحية بشرح دواعي استعمال الدواء الجديد لك وما يتعلق به؟**

- ○ أبداً
- ○ أحياناً
- ○ غالباً
- ○ دائماً
- ○ لا ينطبق
- ○ لا أعلم / امتنع عن الإجابة

التقييم العام للمستشفى:

21. **مستخدماً الأرقام من (صفر) إلى (5)، حيث يمثل (صفر) أسوأ مستشفى على الإطلاق، بينما يمثل الرقم (5) أفضل مستشفى على الإطلاق، أي رقم ستختار لتقييم هذه المستشفى خلال فترة إقامتك فيها؟**

- ○ صفر -أسوأ مستشفى
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5 -أفضل مستشفى
- ○ لا أعلم / امتنع عن الإجابة

19. **خلال إقامتك في المستشفى، هل حدثك الأطباء، أو طاقم التمريض، أو مقدمي الرعاية الصحية عما إذا كنت ستتلقى الرعاية التي تحتاجها عند خروجك من المستشفى؟**

- ○ نعم
- ○ لا
- ○ لا ينطبق
- ○ لا أعلم / امتنع عن الإجابة

20. **خلال إقامتك في المستشفى، هل استلمت إشعاراً خطياً بالأعراض او المشكلات الصحية التي يتعين عليك ترصدها بعد خروجك من المستشفى؟**

- ○ نعم
- ○ لا
- ○ لا ينطبق
- ○ لا أعلم / امتنع عن الإجابة

لدينا القليل من الأسئلة الإضافية حول اقامتك في المستشفى، يرجى تحديد ما إذا كنت تعارض بشدة، أو تعارض، أو توافق أو توافق بشدة على الجمل الآتية:

23. **خلال فترة إقامتك في المستشفى، أخذ مقدمي الرعاية الصحية بعين الاعتبار ما تفضله أنت وأفراد عائلتك عند تحديد احتياجاتك للرعاية بعد خروجك من المستشفى.**

- ○ أعارض بشدة
- ○ أعارض
- ○ أوافق
- ○ أوافق بشده
- ○ لا أعلم / امتنع عن الإجابة

22. هل تنصح أفراد عائلتك وأصدقائك بهذه المستشفى؟

- ○ لا على الإطلاق
- ○ على الأرجح لا
- ○ على الأرجح نعم
- ○ حتماً نعم
- ○ لا أعلم / امتنع عن الإجابة

معلوماتك الشخصية:

الأسئلة التالية تتعلق بمعلوماتك الشخصية

26. ما مدى تقييمك لصحتك بشكل عام؟

- ○ ممتازة
- ○ جيدة جداً
- ○ جيدة
- ○ مقبولة
- ○ سيئة
- ○ لا أعلم / امتنع عن الإجابة

27. كم عمرك؟

- ○ 24-18
- ○ 34-25
- ○ 44-35
- ○ 54-45
- ○ 64-55
- ○ 74-65
- ○ 75 فما فوق

28. الجنس:

- ○ ذكــر
- ○ أنثى

24. عند خروجك من المستشفى، كنت على إدراك تام بالأمور التي يجب عليك توليها لمراعاة صحتك.

- ○ أعارض بشدة
- ○ أعارض
- ○ أوافق
- ○ أوافق بشده
- ○ لا أعلم / امتنع عن الإجابة

25. عند خروجك من المستشفى، كنت على إدراك تام بالغرض من تناول كافة أدويتك.

- ○ أعارض بشدة
- ○ أعارض
- ○ أوافق
- ○ أوافق بشده
- ○ لم اعطَ أية أدوية عند مغادرتي المستشفى
- ○ لا أعلم / امتنع عن الإجابة

29. ما هو مستواك التعليمي؟

- ○ إكمال مرحلة التعليم الابتدائي
- ○ إكمال مرحلة التعليم المتوسط
- ○ إكمال مرحلة التعليم الثانوي
- ○ خريج جامعي
- ○ حاصل على درجة فوق الجامعية

30. ما هو موطنك الأصلي؟

- ○ ----------

Appendix C: Patient Characteristics per Hospital Type.

Parameters	Hospital Type		
	Public	Private	Total
Patient's overall health rating			
Excellent	1901 (18.9)	1013 (25.3)	2914 (20.7)
Very good	3154 (31.3)	1512 (37.7)	4666 (33.1)
Good	3989 (39.6)	1276 (31.8)	5265 (37.4)
Fair	971 (9.6)	199 (5)	1170 (8.3)
Poor	69 (0.7)	8 (0.2)	77 (0.6)
Total	10084 (100.0)	4008 (100.0)	14092 (100.0)
Age			
18-24	873 (8.6)	357 (8.9)	1230 (8.7)
25-34	3733 (36.9)	1566 (38.8)	5299 (37.4)
35-44	2765 (27.3)	1336 (33.1)	4101 (29)
45-54	1443 (14.3)	570 (14.1)	2013 (14.2)
55-64	863 (8.5)	169 (4.2)	1032 (7.3)
65-74	314 (3.1)	29 (0.7)	343 (2.4)
75 or older	132 (1.3)	5 (0.1)	137 (1.0)
Total	10123 (100.0)	4032 (100.0)	14155 (100.0)
Gender			
Female	5426 (54.7)	2217 (55.4)	7643 (54.9)
Male	4494 (45.3)	1786 (44.6)	6280 (45.1)
Total	9920 (100.0)	4003 (100.0)	13923 (100.0)
Education Level			
Elementary level	1198 (12.4)	62 (1.6)	1260 (9.2)
Preparatory level	890 (9.2)	119 (3.0)	1009 (7.4)
Secondary level	3129 (32.3)	930 (23.4)	4059 (29.7)
University Graduate	3838 (39.7)	2326 (58.5)	6164 (45.2)
Postgraduate	621 (6.4)	538 (13.5)	1159 (8.5)
Total	9676 (100.0)	3975 (100.0)	13651 (100.0)
Nationality			
Non-Qatari	7640 (76.3)	2775 (70.7)	10415 (74.7)
Qatari	2374 (23.7)	1153 (29.4)	3527 (25.3)
Total	10014 (100.0)	3928 (100.0)	13942 (100.0)

Appendix D: Total Patient's Responses to Survey Question per Domain.

HIE Domains	Frequency (n*)	mean (SD⁂)	Median (IQR⁂⁂)
Communication with Nurses	(n= 14359)	91.2 (16.0)	100 (11.1)
(Q1) During this hospital stay, how often did nurses treat you with courtesy and respect	14312	91.8 (18.1)	100 (0.0)
(Q2) During this hospital stay, how often did nurses listen carefully to you?	14274	91.9 (18.2)	100 (0.0)
(Q3) During this hospital stay, how often did nurses explain things in a way you could understand?	14293	90.1 (19.7)	100 (0.0)
Communication with Doctors	(n= 14332)	91.5 (15.4)	100 (11.1)
(Q5) During this hospital stay, how often did doctors treat you with courtesy and respect?	14240	92.6 (16.9)	100 (0.0)
(Q6) During this hospital stay, how often did doctors listen carefully to you?	14110	92.0 (17.5)	100 (0.0)
(Q7) During this hospital stay, how often did doctors explain things in a way you could understand?	14065	90.1 (19.5)	100 (0.0)
Responsiveness of Staff	(n= 13988)	87.5 (20.3)	100 (33.3)
(Q4) During this hospital stay, after you requested assistance, how often did you get help as soon as you wanted it?	13849	90.5 (19.7)	100 (0.0)
(Q11) How often did you get help in getting to the bathroom or in using a bedpan as soon as you wanted?	5791	75.1 (31.9)	100 (33.3)
Pain Management	(n= 10814)	87.5 (18.2)	100 (16.7)
(Q13) During this hospital stay, how often was your pain well controlled?	10526	85.0 (22.6)	100 (33.3)
(Q14) During this hospital stay, how often did the hospital staff do everything they could to help you with your pain?	10619	90.1 (19.4)	100 (0.0)
Communication about Medicine	(n= 9102)	84.4 (23.0)	100 (33.3)

HIE Domains	Frequency (n*)	mean (SD⁑)	Median (IQR⁂)
(Q16) Before giving you any new medicine, how often did hospital staff tell you what the medicine was for?	8639	86.2 (24.0)	100 (33.3)
(Q17) Before giving you any new medicine, how often did hospital staff describe possible side effects in a way you could understand?	8656	82.7 (28.4)	100 (33.3)
Discharge Information	(n= 11551)	80.3 (34.5)	100 (50.0)
(Q19) During this hospital stay, did doctors, nurses, or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?	10814	87.0 (33.6)	100 (0.0)
(Q20) During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?	11551	75.5 (43.0)	100 (0.0)
Cleanness of the Hospital	(n= 14082)	86.9 (22.1)	100 (33.3)
(Q8) During this hospital stay, how often were your room and toilet kept clean?	14082	86.9 (22.1)	100 (33.3)
Quietness of the Hospital	(n= 14027)	82.4 (24.8)	100 (33.3)
(Q9) During this hospital stay, how often was the area around your room quiet at night?	14027	82.4 (24.8)	100 (33.3)

* n: Total number of responses
⁑ SD: Standard deviation
⁂ IQR: interquartile range

Appendix E: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Communication with Nurses in Multivariable Multilevel Regression.

Parameters	Communication with Nurses			
	Adjusted Estimate of Association	SE†	95% CI‡	*P*-Value
Intercept	41.1	8.0	(25.5, 56.8)	<0.001
Hospital type				
Public hospital	Ref			
Private hospital	10.1	7.8	(-5.2, 25.4)	0.196
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-10.8	8.9	(-28.4, 6.7)	0.225
134-287 beds	-20.6	6.7	(-33.6, -7.5)	0.002
More than 287 beds	-24.9	8.6	(-41.8, -7.9)	0.004
Patient's overall health rating				
Excellent	Ref			
Very good	0.02	0.4	(-0.9, 0.8)	0.955
Good	-0.6	0.4	(-1.5, 0.2)	0.157
Fair	0.1	0.7	(-1.3, 1.5)	0.891
Poor	-5.2	3.4	(-11.9, 1.5)	0.131
Age (years)				
18-24 years	Ref			
25-34 years	-0.3	0.5	(-1.2, 0.6)	0.550
35-44 years	-0.1	0.5	(-0.9, 0.8)	0.870
45-54 years	-0.6	0.6	(-1.7, 0.5)	0.266
55-64 years	-0.3	0.7	(-1.7, 1.0)	0.629
65-74 years	0.4	1.2	(-1.9, 2.7)	0.739
75 years or older	0.4	1.9	(-3.3, 4.1)	0.826
Gender				
Female	Ref			
Male	-1.1	0.3	(-1.7, -0.5)	<0.001
Education level				
Elementary level	Ref			
Preparatory level	-0.8	0.7	(-2.2, 0.6)	0.284
Secondary level	-0.3	0.5	(-1.3, 0.7)	0.559
University graduate	0.3	0.5	(-0.8, 1.3)	0.623
Postgraduate	0.8	0.6	(-0.4, 2.0)	0.193
Nationality				
Non-Qatari	Ref			
Qatari	0.01	0.3	(-0.7, 0.7)	0.974

Parameters	Communication with Nurses			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with doctors	0.4	0.02	(0.3, 0.4)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Pain management	0.1	0.01	(0.1, 0.1)	<0.001
Communication about medicine	0.03	0.01	(0.02, 0.1)	<0.001
Discharge information	0.006	0.01	(-0.02, 0.007)	0.342
Cleanliness of hospital environment	0.1	0.01	(0.1, 0.1)	<0.001
Quietness of hospital environment	0.01	0.01	(0.005, 0.03)	0.009

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix F: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Communication with Doctors in Multivariable Multilevel Regression.

Parameters	Communication with Doctors			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	45.3	4.4	(36.7, 53.9)	<0.001
Hospital type				
Public hospital	Ref			
Private hospital	1.6	5.8	(-9.8, 13.1)	0.779
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-27.5	4.9	(-37.2, -17.8)	<0.001
134-287 beds	-20.9	5.9	(-32.5, -9.2)	<0.001
More than 287 beds	-13.1	5.2	(-23.3, -3.0)	0.011
Patient's overall health rating				
Excellent	Ref			
Very good	-0.2	0.4	(-0.9, 0.6)	0.690
Good	-0.3	0.4	(-1.1, 0.6)	0.528
Fair	-1.3	0.7	(-2.6, 0.1)	0.077
Poor	-2.5	3.5	(-9.4, 4.5)	0.483
Age (years)				
18-24 years	Ref			
25-34 years	-0.7	0.4	(-1.5, 0.02)	0.058
35-44 years	-0.8	0.5	(-1.8, 0.3)	0.142
45-54 years	-0.1	0.5	(-1.1, 0.9)	0.850
55-64 years	-0.7	0.7	(-2.0, 0.6)	0.306
65-74 years	1.4	0.9	(-0.4, 3.2)	0.129
75 years or older	2.6	2.4	(-2.0, 7.2)	0.271
Gender				
Female	Ref			
Male	-0.8	0.3	(-1.4, -0.3)	0.004
Education level				
Elementary level				
Preparatory level	-0.5	0.9	(-2.3, 1.3)	0.579
Secondary level	0.6	0.5	(-0.5, 1.7)	0.275
University graduate	1.6	0.6	(0.5, 2.7)	0.005
Postgraduate	1.8	0.6	(0.6, 2.9)	0.002
Nationality				
Non-Qatari	Ref			
Qatari	0.1	0.4	(-0.6, 0.9)	0.684

Parameters	Communication with Doctors			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with nurses	0.41	0.02	(0.4, 0.5)	<0.001
Responsiveness of hospital staff	0.05	0.01	(0.03, 0.1)	<0.001
Pain management	0.07	0.01	(0.05, 0.1)	<0.001
Communication about medicine	0.07	0.01	(0.1, 0.1)	<0.001
Discharge information	-0.004	0.005	(-0.01, 0.01)	0.393
Cleanliness of hospital environment	0.04	0.01	(0.03, 0.1)	<0.001
Quietness of hospital environment	0.04	0.01	(0.03, 0.1)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix G: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Responsiveness of Hospital Staff in Multivariable Multilevel Regression.

Parameters	Responsiveness of Hospital Staff			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	28.5	13.9	(1.3, 55.7)	0.040
Hospital type				
Public hospital	Ref			
Private hospital	-3.4	10.4	(-23.8, 16.9)	0.740
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-5.3	13.8	(-32.5, 21.8)	0.701
134-287 beds	-12.3	12.9	(-37.5, 12.9)	0.341
More than 287 beds	-25.7	14.4	(-53.9, 2.6)	0.075
Patient's overall health rating				
Excellent	Ref			
Very good	0.5	0.5	(-0.4, 1.6)	0.296
Good	1.8	0.6	(0.7, 3.3)	0.002
Fair	2.1	1.0	(0.2, 3.9)	0.031
Poor	0.5	3.1	(-5.6, 6.3)	0.869
Age (years)				
18-24 years	Ref			
25-34 years	-0.2	0.8	(-1.8, 1.4)	0.796
35-44 years	-0.8	0.9	(-2.5, 0.9)	0.397
45-54 years	0.4	1.0	(-1.5, 2.3)	0.696
55-64 years	-1.3	1.1	(-3.5, 0.9)	0.236
65-74 years	-0.3	2.0	(-4.2, 3.5)	0.866
75 years or older	7.2	3.5	(0.4, 13.9)	0.038
Gender				
Female	Ref			
Male	0.4	0.4	(-0.4, 1.2)	0.311
Education level				
Elementary level	Ref			
Preparatory level	2.0	1.5	(-0.9, 4.9)	0.184
Secondary level	0.1	0.9	(-1.7, 1.9)	0.895
University graduate	0.7	0.9	(-1.1, 2.6)	0.451
Postgraduate	0.2	1.3	(-2.4, 2.7)	0.887
Nationality				
Non-Qatari	Ref			
Qatari	-0.2	0.5	(-1.3, 0.9)	0.710

Parameters	Responsiveness of Hospital Staff			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with nurses	0.3	0.04	(0.3, 0.4)	<0.001
Communication with doctors	0.1	0.03	(0.1, 0.2)	<0.001
Pain management	0.1	0.02	(0.1, 0.2)	<0.001
Communication about medicine	0.1	0.01	(0.1, 0.1)	<0.001
Discharge information	0.01	0.01	(<0.001, 0.03)	0.040
Cleanliness of hospital environment	0.1	0.01	(0.04, 0.1)	<0.001
Quietness of hospital environment	0.1	0.01	(0.02, 0.1)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix H: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Pain Management in Multivariable Multilevel Regression.

Parameters	Pain Management			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	21.9	13.6	(-4.8, 48.5)	0.108
Hospital type				
Public hospital	Ref			
Private hospital	-0.4	10.7	(-21.5, 20.6)	0.967
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	3.3	13.7	(-23.6, 30.2)	0.811
134-287 beds	2.8	12.3	(-21.3, 26.9)	0.819
More than 287 beds	-5.5	13.6	(-32.1, 21.1)	0.686
Patient's overall health rating				
Excellent	Ref			
Very good	-2.0	0.5	(-2.9, -0.9)	<0.001
Good	-4.1	0.6	(-5.2, -2.9)	<0.001
Fair	-5.5	0.9	(-7.3, -3.6)	<0.001
Poor	-7.5	3.3	(-13.9, -1.0)	0.023
Age (years)				
18-24 years	Ref			
25-34 years	0.9	0.7	(-0.4, 2.2)	0.178
35-44 years	0.9	0.7	(-0.5, 2.3)	0.216
45-54 years	0.5	0.9	(-1.3, 2.3)	0.596
55-64 years	1.2	1.1	(-0.9, 3.3)	0.274
65-74 years	1.0	1.6	(-2.1, 4.2)	0.523
75 years or older	3.0	2.9	(-2.7, 8.7)	0.305
Gender				
Female	Ref			
Male	0.5	0.4	(-0.3, 1.2)	0.249
Education level				
Elementary level	Ref			
Preparatory level	-1.8	1.0	(-3.9, 0.2)	0.078
Secondary level	-0.7	0.7	(-2.1, 0.7)	0.331
University graduate	-0.1	0.7	(-1.4, 1.2)	0.889
Postgraduate	-0.3	0.9	(-2.1, 1.5)	0.758
Nationality				
Non-Qatari	Ref			
Qatari	-0.6	0.5	(-1.6, 0.4)	0.217

Parameters	Pain Management			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with nurses	0.2	0.03	(0.2, 0.3)	<0.001
Communication with doctors	0.1	0.03	(0.1, 0.2)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Communication about medicine	0.2	0.02	(0.1, 0.2)	<0.001
Discharge information	0.04	0.01	(0.02, 0.1)	<0.001
Cleanliness of hospital environment	0.04	0.01	(0.02, 0.1)	0.001
Quietness of hospital environment	0.1	0.01	(0.1, 0.1)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix I: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Communication about Medicine in Multivariable Multilevel Regression.

Parameters	Communication about Medicine			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	24.6	10.0	(4.9, 44.2)	0.014
Hospital type				
Public hospital	Ref			
Private hospital	-17.8	10.3	(-37.9, 2.3)	0.083
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-12.1	10.4	(-32.5, 8.2)	0.243
134-287 beds	-21.5	10.3	(-41.7, -1.3)	0.037
More than 287 beds	-26.2	10.8	(-47.4, -5.0)	0.015
Patient's overall health rating				
Excellent	Ref			
Very good	-2.7	0.6	(-3.9, -1.5)	<0.001
Good	-2.2	0.7	(-3.6, -0.9)	0.001
Fair	-3.6	1.2	(-5.9, -1.3)	0.002
Poor	-15.5	7.1	(-29.4, -1.7)	0.028
Age (years)				
18-24 years	Ref			
25-34 years	0.5	0.9	(-1.2, 2.1)	0.586
35-44 years	-0.2	0.8	(-1.9, 1.4)	0.808
45-54 years	-0.1	1.0	(-1.9, 1.8)	0.938
55-64 years	0.3	1.2	(-2.0, 2.6)	0.818
65-74 years	0.1	2.3	(-4.5, 4.7)	0.953
75 years or older	-5.8	3.7	(-12.9, 1.4)	0.116
Gender				
Female	Ref			
Male	-0.9	0.5	(-1.9, 0.1)	0.090
Education level				
Elementary level	Ref			
Preparatory level	-0.9	1.2	(-3.3, 1.5)	0.457
Secondary level	0.2	1.0	(-1.8, 2.1)	0.875
University graduate	-1.1	1.0	(-3.0, 0.8)	0.240
Postgraduate	-2.3	1.3	(-4.9, 0.2)	0.074
Nationality				
Non-Qatari	Ref			
Qatari	0.1	0.5	(-0.9, 1.1)	0.808

Parameters	Communication about Medicine			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with nurses	0.1	0.03	(0.1, 0.2)	<0.001
Communication with doctors	0.2	0.03	(0.2, 0.3)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Pain management	0.2	0.02	(0.2, 0.3)	<0.001
Discharge information	0.1	0.01	(0.1, 0.1)	<0.001
Cleanliness of hospital environment	0.1	0.02	(0.04, 0.1)	<0.001
Quietness of hospital environment	0.1	0.01	(0.1, 0.1)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix J: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Discharge Information in Multivariable Multilevel Regression

Parameters	Discharge Information			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	10.7	14.5	(-17.8, 39.1)	0.462
Hospital type				
Public hospital	Ref			
Private hospital	19.4	13.1	(-6.3, 45.2)	0.140
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	27.3	14.0	(-0.1, 54.6)	0.051
134-287 beds	8.0	15.0	(-21.4, 37.4)	0.594
More than 287 beds	34.8	14.7	(5.9, 63.6)	0.018
Patient's overall health rating				
Excellent	Ref			
Very good	-2.7	1.3	(-5.2, -0.1)	0.039
Good	-5.0	1.1	(-7.3, -2.8)	<0.001
Fair	-6.5	2.0	(-10.5, -2.6)	0.001
Poor	-6.7	5.5	(-17.4, 4.0)	0.222
Age (years)				
18-24 years	Ref			
25-34 years	2.2	1.3	(-0.3, 4.8)	0.087
35-44 years	4.1	1.5	(1.2, 6.9)	0.005
45-54 years	9.2	1.9	(5.4, 12.9)	<0.001
55-64 years	5.8	1.9	(2.1, 9.6)	0.002
65-74 years	5.4	3.2	(-0.9, 11.6)	0.091
75 years or older	-7.8	6.7	(-20.9, 5.3)	0.241
Gender				
Female	Ref			
Male	-1.4	0.9	(-3.1, 0.3)	0.100
Education level				
Elementary level	Ref			
Preparatory level	-2.0	1.9	(-5.6, 1.6)	0.283
Secondary level	-0.6	1.7	(-3.8, 2.7)	0.728
University graduate	3.0	1.5	(-0.1, 5.9)	0.056
Postgraduate	5.6	2.2	(1.3, 9.9)	0.010
Nationality				
Non-Qatari	Ref			
Qatari	-1.4	0.9	(-3.1, 0.4)	0.132

	Discharge Information			
Parameters	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with nurses	-0.05	0.05	(-0.2, 0.1)	0.366
Communication with doctors	-0.04	0.04	(-0.1, 0.03)	0.343
Responsiveness of hospital staff	0.05	0.02	(<0.001, 0.1)	0.049
Pain management	0.18	0.03	(0.1, 0.2)	<0.001
Communication about medicine	0.31	0.03	(0.3, 0.4)	<0.001
Cleanliness of hospital environment	0.02	0.02	(-0.02, 0.1)	0.315
Quietness of hospital environment	0.02	0.03	(-0.03, 0.1)	0.385

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix K: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Cleanliness of Hospital Environment in Multivariable Multilevel Regression

Parameters	Cleanliness of Hospital Environment			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	28.5	13.5	(1.9, 54.9)	0.036
Hospital type				
Public hospital	Ref			
Private hospital	-9.6	7.7	(-24.8, 5.5)	0.213
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-9.1	15.9	(-40.3, 22.1)	0.568
134-287 beds	-7.5	12.6	(-32.3, 17.3)	0.552
More than 287 beds	-7.0	16.8	(-40.0, 26.0)	0.678
Patient's overall health rating				
Excellent	Ref			
Very good	-1.4	0.5	(-2.4, -0.4)	0.008
Good	-1.5	0.6	(-2.7, -0.4)	0.010
Fair	-2.1	0.9	(-3.8, -0.3)	0.024
Poor	2.2	3.6	(-5.0, 9.3)	0.555
Age (years)				
18-24 years	Ref			
25-34 years	-2.1	0.8	(-3.7, -0.6)	0.007
35-44 years	-1.2	0.7	(-2.6, 0.1)	0.062
45-54 years	-1.4	1.0	(-3.4, 0.6)	0.166
55-64 years	-0.4	0.9	(-2.2, 1.5)	0.700
65-74 years	-4.0	2.5	(-8.9, 0.9)	0.117
75 years or older	0.4	3.5	(-6.5, 7.2)	0.918
Gender				
Female	Ref			
Male	0.4	0.6	(-0.8, 1.6)	0.522
Education level				
Elementary level	Ref			
Preparatory level	-2.5	1.1	(-4.7, -0.4)	0.020
Secondary level	-0.2	0.7	(-1.6, 1.2)	0.769
University graduate	-0.6	0.7	(-1.9, 0.8)	0.405
Postgraduate	-0.8	1.0	(-2.8, 1.1)	0.395
Nationality				
Non-Qatari	Ref			
Qatari	-4.2	0.8	(-5.7, -2.6)	<0.001

Parameters	Cleanliness of Hospital Environment			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with nurses	0.3	0.03	(0.2, 0.3)	<0.001
Communication with doctors	0.2	0.04	(0.1, 0.2)	<0.001
Responsiveness of hospital staff	0.1	0.01	(0.1, 0.1)	<0.001
Pain management	0.1	0.03	(0.02, 0.1)	0.009
Communication about medicine	0.1	0.02	(0.04, 0.1)	<0.001
Discharge information	0.01	0.01	(-0.01, 0.03)	0.469
Quietness of hospital environment	0.1	0.01	(0.1, 0.2)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix L: Adjusted Associations Between Hospital-Level and Patient-Level Variables with Quietness of Hospital Environment in Multivariable Multilevel Regression

Parameters	Quietness of Hospital Environment			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Intercept	32.0	8.6	(15.2, 48.8)	<0.001
Hospital type				
Public hospital	Ref			
Private hospital	-15.2	6.4	(-27.7, -2.7)	0.017
Hospital bed capacity (beds)				
Less than 61 beds	Ref			
61-133 beds	-14.3	12.4	(-38.5, 9.9)	0.247
134-287 beds	-20.6	15.7	(-51.4, 10.2)	0.191
More than 287 beds	-27.3	9.3	(-45.5, -9.2)	0.003
Patient's overall health rating				
Excellent	Ref			
Very good	-1.0	0.4	(-1.9, -0.2)	0.020
Good	-1.6	1.1	(-3.8, 0.6)	0.159
Fair	-1.8	1.6	(-4.9, 1.3)	0.256
Poor	0.1	3.8	(-7.3, 7.5)	0.974
Age (years)				
18-24 years	Ref			
25-34 years	-0.1	1.0	(-1.9, 1.9)	0.958
35-44 years	-1.6	1.1	(-3.7, 0.4)	0.122
45-54 years	-0.1	0.5	(-1.0, 0.8)	0.790
55-64 years	1.3	0.3	(0.8, 1.9)	<0.001
65-74 years	-0.6	2.0	(-4.4, 3.3)	0.780
75 years or older	-9.4	5.4	(-19.9, 1.2)	0.082
Gender				
Female	Ref			
Male	0.2	0.6	(-0.9, 1.3)	0.723
Education level				
Elementary level	Ref			
Preparatory level	1.5	1.4	(-1.2, 4.1)	0.288
Secondary level	0.7	0.9	(-1.2, 2.5)	0.462
University graduate	-1.4	1.2	(-3.7, 0.9)	0.245
Postgraduate	-2.3	1.9	(-6.0, 1.4)	0.217
Nationality				
Non-Qatari	Ref			
Qatari	-1.0	0.4	(-1.7, -0.2)	0.018

Parameters	Quietness of Hospital Environment			
	Adjusted Estimate of Association	SE†	95% CI‡	P-Value
Patient Experience Domains and items				
Communication with nurses	0.1	0.04	(0.01, 0.2)	0.032
Communication with doctors	0.2	0.03	(0.1, 0.2)	<0.001
Responsiveness of hospital staff	0.1	0.02	(0.03, 0.1)	0.001
Pain management	0.1	0.01	(0.1, 0.2)	<0.001
Communication about medicine	0.1	0.003	(0.1, 0.1)	<0.001
Discharge information	0.01	0.01	(-0.001, 0.03)	0.075
Cleanliness of hospital environment	0.2	0.01	(0.2, 0.2)	<0.001

Ref: Reference category
SE†: Standard error (Bootstrap)
95% CI‡: 95% Confidence interval (Bootstrap)

Appendix M: Unadjusted HCAHPS Scores by Survey Year and Hospital Type

Patient Experience Domain	Public		Private		Annual HIE Score	
	Mean (95% CI)	Count	Mean (95% CI)	Count	Mean (95% CI)	Count
Communication with nurses						
2017	90.8 (90.3 ,91.4)	3142	96.9 (96.5 ,97.4)	1424	92.7 (92.3 ,93.2)	4566
2018	89.5 (88.9 ,90.1)	3517	96.5 (96.0 ,96.9)	1457	91.6 (91.1 ,92.0)	4974
2019	87.7 (87.1 ,88.3)	3642	94.8 (94.1 ,95.4)	1177	89.4 (88.9 ,89.9)	4819
Communication with doctors						
2017	91.6 (91.1 ,92.2)	3138	96.7 (96.2 ,97.2)	1423	93.2 (92.8 ,93.6)	4561
2018	89.4 (88.8 ,90.0)	3506	96.0 (95.5 ,96.5)	1456	91.3 (90.9 ,91.8)	4962
2019	88.7 (88.1 ,89.3)	3632	94.5 (93.8 ,95.1)	1177	90.1 (89.6 ,90.6)	4809
Responsiveness of hospital staff						
2017	85.8 (85.0 ,86.6)	3047	92.7 (91.9 ,93.5)	1410	88 (87.4 ,88.6)	4457
2018	85.5 (84.8 ,86.2)	3410	93.8 (93.1 ,94.5)	1438	88 (87.4 ,88.5)	4848
2019	84.6 (83.9 ,85.4)	3515	92.5 (91.7 ,93.3)	1168	86.6 (86 ,87.2)	4683
Pain management						
2017	84.6 (83.7 ,85.5)	2202	91.9 (91.1 ,92.7)	1161	87.1 (86.5 ,87.8)	3363
2018	86.2 (85.4 ,86.9)	2617	91.6 (90.8 ,92.4)	1245	87.9 (87.4 ,88.5)	3862
2019	85.5 (84.8 ,86.2)	2541	91.8 (90.9 ,92.6)	1048	87.4 (86.8 ,87.9)	3589
Communication about medicine						
2017	82.5 (81.4 ,83.6)	1885	82.7 (80.9 ,84.4)	765	82.5 (81.6 ,83.5)	2650
2018	85.3 (84.5 ,86.2)	2534	81.7 (79.8 ,83.6)	667	84.6 (83.8 ,85.4)	3201
2019	84.5 (83.6 ,85.4)	2434	89 (87.7 ,90.3)	817	85.6 (84.9 ,86.4)	3251
Discharge information						
2017	73.1 (71.7 ,74.6)	2415	66.4 (64.4 ,68.4)	1247	70.8 (69.7 ,72.0)	3662
2018	77.4 (76.1 ,78.7)	2727	75.2 (73.2 ,77.2)	1225	76.7 (75.7 ,77.8)	3952
2019	79.8 (78.6 ,81.0)	2879	81.3 (79.4 ,83.3)	1058	80.2 (79.2 ,81.2)	3937

Patient Experience Domain	Public		Private		Annual HIE Score	
	Mean (95% CI)	Count	Mean (95% CI)	Count	Mean (95% CI)	Count
Cleanliness of hospital environment						
2017	87.3 (86.5 ,88.1)	3071	90.7 (89.7 ,91.7)	1389	88.4 (87.7 ,89.0)	4460
2018	85.3 (84.5 ,86.1)	3431	91.0 (90.1 ,91.9)	1439	87.0 (86.4 ,87.6)	4870
2019	84.2 (83.4 ,85.0)	3590	89.3 (88.3 ,90.4)	1162	85.4 (84.8 ,86.1)	4752
Quietness of hospital environment						
2017	80.9 (80.0 ,81.8)	3065	84.6 (83.4 ,85.9)	1395	82.1 (81.3 ,82.8)	4460
2018	80.9 (80.1 ,81.8)	3426	84.4 (83.1 ,85.6)	1416	81.9 (81.2 ,82.7)	4842
2019	82.1 (81.3 ,82.9)	3569	86.5 (85.3 ,87.7)	1156	83.2 (82.5 ,83.8)	4725
Overall hospital rating						
2017	87.7 (87.2 ,88.3)	3144	87.8 (87.1 ,88.6)	1424	87.7 (87.3 ,88.2)	4568
2018	88.6 (88.1 ,89.1)	3517	88.1 (87.5 ,88.8)	1458	88.5 (88.1 ,88.9)	4975
2019	88.1 (87.5 ,88.6)	3647	90.3 (89.5 ,91.0)	1177	88.6 (88.2 ,89.0)	4824
Recommendation of hospital						
2017	86.4 (85.7 ,87.1)	3144	90.1 (89.3 ,91.0)	1424	87.6 (87.0 ,88.1)	4568
2018	87.2 (86.5 ,87.8)	3517	93.3 (92.6 ,94.1)	1458	89.0 (88.5 ,89.5)	4975
2019	86.7 (86.0 ,87.4)	3647	94.9 (94.2 ,95.7)	1177	88.7 (88.2 ,89.3)	4824

Appendix N: List of Command Syntax

*** Thesis II Analysis

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*** Overall Rating of Hospital Models ***

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**Outcome (1): Overall rating of the hospital

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating|| Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type

i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type

i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Clean_hosp_env, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_rating i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env

Quiet_hosp_env, reml

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*** Recommendation of the hospital Models ***

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**Outcome (2): Overall recommendation of the hospital

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend

i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender

i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain

Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Clean_hosp_env, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain

Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env, reml

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*** Other domains Models ***

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*Communication with Nurse

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**Outcome: Communication with Nurse

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type

i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type

i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type

i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Clean_hosp_env, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)
- *Hospital level and patient-level final model (Model 5)*
- bootstrap, reps(1000)seed(0): mixed Nur_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env, reml

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*Communication with Doctors

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**Outcome: Communication with Doctors

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type

i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality

Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality

Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Clean_hosp_env, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Doc_comm_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain

Disch_info_domain Clean_hosp_env Quiet_hosp_env, reml

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*Responsiveness of hospital staff

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**Outcome: Responsiveness of hospital staff

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain

Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain

Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Clean_hosp_env, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain

Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Resp_hosp_staff_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env, reml

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*Pain management

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**Outcome: Pain management

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env ||

Hospital: Education, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env ||

Hospital: Disch_info_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Clean_hosp_env, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Pain_manag_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env, reml

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*Communication about medicines

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**Outcome:Communication about medicines

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend || Hospital:,

reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env ||

Hospital: Nationality, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env ||

Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Clean_hosp_env, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Comm_Rx_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain

Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env, reml

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*Discharge information

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**Outcome:Discharge information

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Overall_Hosp_recommend i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env ||

Hospital:Overall_health, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env ||

Hospital: Nur_comm_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env ||

Hospital: Clean_hosp_env, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)
- *Hospital level and patient-level final model (Model 5)*
- bootstrap, reps(1000)seed(0): mixed Disch_info_domain i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Clean_hosp_env Quiet_hosp_env, reml

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*Cleanliness of patient's room

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**Outcome: Cleanliness of patient's room

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital:Gender, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain

Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Doc_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain

Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Quiet_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Clean_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Quiet_hosp_env, reml

****

*Quietness of patient's room

****

**Outcome: Quietness of patient's room

Empty model (Model 1)

- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env || Hospital:, reml

Hospital Level mode (Model 2)

- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat || Hospital:, reml

Hospital level and patient-level fixed effects model (Model 3)

- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital:, reml

level and patient-level random effects model (Model 4)

- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital:Overall_health, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env

|| Hospital:Gender, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Nationality, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Age_group, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Education, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Nur_comm_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env

|| Hospital: Doc_comm_domain, reml variance covariance(unstructured)

- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Resp_hosp_staff_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Pain_manag_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Comm_Rx_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Disch_info_domain, reml variance covariance(unstructured)
- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env

|| Hospital: Clean_hosp_env, reml variance covariance(unstructured)

Hospital level and patient-level final model (Model 5)

- bootstrap, reps(1000)seed(0): mixed Quiet_hosp_env i.Hospital_Type i.Bed_size_cat i.Overall_health i.Age_group i.Gender i.Education i.Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env || Hospital: Overall_health Gender Nationality Nur_comm_domain Doc_comm_domain Resp_hosp_staff_domain Pain_manag_domain Comm_Rx_domain Disch_info_domain Clean_hosp_env , reml

Appendix O: Study Timeline

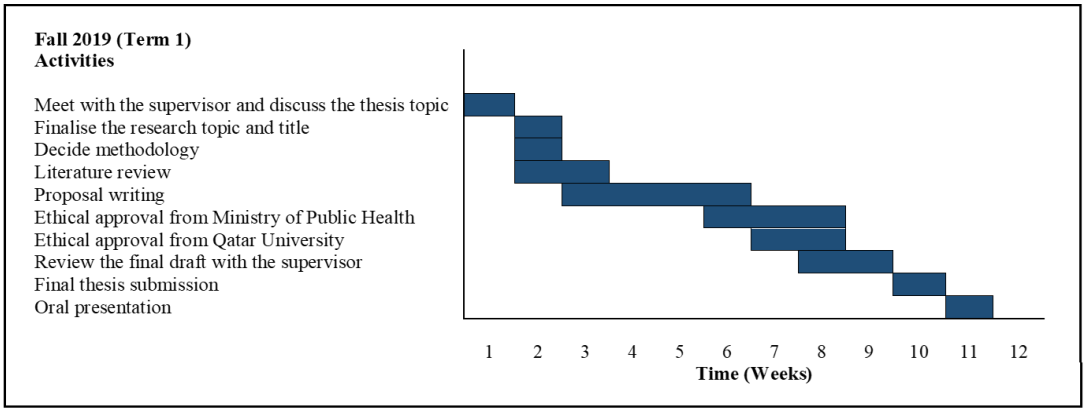

Figure 1. Timeline of thesis I (Study proposal).

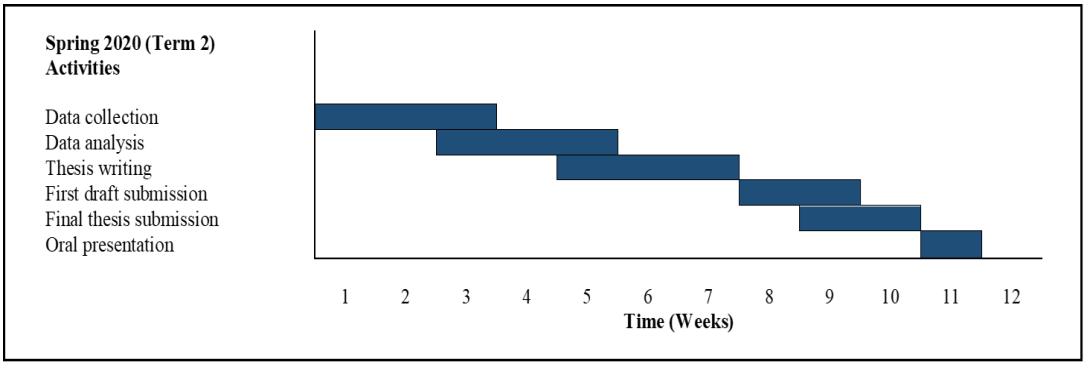

Figure 2. Timeline of thesis II.

Appendix P: Ministry of Public Health IRB Approval

October 6, 2019

Exempt Research Certificate

Dear Applicant,

The Health Research Governance Department at the Ministry of Public health (MoPH) has reviewed the research project entitled *"Adult Hospital Inpatient Experience in Qatar and Associated Factors"*. The Principal Investigator, Ms. Noora Abdulla A. Salem, confirmed that there will be no collection of identifiable information. Upon review, the research has been categorized as **exempt research under category (3):** Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified.

However, please note that in accordance with MoPH policy, the regulations state that "research involving...interview procedures...(**is exempt from this policy**) unless (1) information obtained is recorded in such a matter that human subject can be identified directly or through identifiers linked to the subject **and** (2) disclosure of the human subject responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation". Under conditions mentioned in (1) and (2), the proposal must be reviewed by an Institutional Review Board Committee.

If we can be of further assistance, please contact us at 974-4407-0363 or via email at IRB@moph.gov.qa

Sincerely,

Dr. Eman Sadoun
Manager, Health Research Governance
Ministry of Public Health
E-mail: dresadoun@moph.gov.qa
Phone: 4407-0363

Appendix Q: Qatar University IRB Approval

Qatar University Institutional Review Board **QU-IRB**

QU-IRB Registration: MOPH-QU-010, QU-IRB, Assurance: IRB-A-QU-2019-0009

November 21st, 2019

Dr. Mujahed Shraim
College of Health Sciences
Qatar University
Tel.: 4403 7503
Email: mshraim@qu.edu.qa

Dear Dr. Mujahed Shraim,

Sub.: Research Ethics Review Exemption/Graduate Student Project
Ref.: Student, Noora Abdulla Salem/e-mail: 199055711@student.qu.edu.qa
Project Title: "Adult Hospital Inpatient Experience in Qatar and Associated Factors: A Cross-sectional Study"

We would like to inform you that your application along with the supporting documents provided for the above student project, has been reviewed by the QU-IRB, and having met all the requirements, has been granted research ethics **Exemption** based on the following category(ies) listed in the Policies, Regulations and Guidelines provided by MoPH for Research Involving Human Subjects:

Exemption Category 3: Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified.
Category 4: Research and demonstration projects which are designed to study, evaluate, or otherwise examine: (i) Public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in levels of payment for benefits or services under those programs.

Documents reviewed: QU-IRB Application Human Subject- Ver 2_Bilingual-Noora-20-Nov-2019, QU-IRB Application Material Check List-Noora-Signed, Adult Hospital Inpatient Experience in Qatar and Associated Factors (10 Nov 2019)-Signed Proposal, Exempt Research Certificate-MOPH-Noora, Hospital Inpatient Patient Experience Survey- Arabic, Hospital Inpatient Patient Experience Survey-English, QU-IRB Review Forms, responses to IRB queries and updated documents.

Please note that exempted projects do not require renewal; however, any changes/modifications to the original submitted protocol should be reported to the committee to seek approval prior to continuation.

Your Research Ethics Approval Number is: **QU-IRB 1183-E/19**. Kindly refer to this number in all your future correspondence pertaining to this project. In addition, please submit a closure report to QU-IRB upon completion of the project.

Best wishes,
Dr. Ahmed Awaisu
Chairperson, QU-IRB