

Mofidi, Reza and Marrow, Carol (2017) The effects of the NHS reforms on quality of care. British Journal of Healthcare Management, 23 (3). pp. 120-130.

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British Journal of Healthcare Management

Quality of care provided by the Shelford Group of NHS trusts before and after the enactment of Health and Social Care Act of 2012 (HSCA2012).

--Manuscript Draft--

Manuscript Number:	bjhc.2016.0020R1
Full Title:	Quality of care provided by the Shelford Group of NHS trusts before and after the enactment of Health and Social Care Act of 2012 (HSCA2012).
Short Title:	Health and Social care act of 2012 and Quality of care in England
Article Type:	Original research
Keywords:	Shelford Group Quality of Care NHS Quality Outcomes Framework Key Performance Indicators Health and Social care act of 2012 (HSCA2012)
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Abstract:	<p>Health and Social Care Act of 2012 (HSCA2012) has altered the operational and business environment within which NHS trusts in England operate. Shelford group are the leading multi-specialty NHS trusts in England. The aim of this study was to assess the impact of HSCA2012 on the quality of care provided by the Shelford group. Annual quality of accounts produced by each of the Shelford group NHSTs for financial years FY 12-13, FY 13-14 and FY 14-15 were reviewed. The key performance indicators for each organization were collected and classified in line with NHS Quality Outcomes Framework (QOF). KPIs for the period just prior to enactment of HSCA2012 (FY12-13) were compared with the corresponding values for the period after the enactment of HSCA2012. The benchmarking model used in the study was validated against the Hospital Intelligent Monitoring Report (HIMR) used by the Care Quality Commission.</p> <p>The clinical services provided by the Shelford group increased year on year by 7.5%, 6.4% and 4% respectively. In the FY14-15 Shelford group collectively provided 14,735,000 patient care episodes. There was no significant difference in the value of the KPIs before and after enactment of HSCA2012 along the 6 domains defined by the NHS-QOF. Good correlation was observed between the benchmarking method used in the study compared with the HIMR ($r^2=0.86$).</p> <p>The quality of care provided by the Shelford group of NHS trusts did not change following enactment of HSCA2012.</p>
Suggested Reviewers:	
Response to Reviewers:	<p>Dear Sir/Madame</p> <p>This manuscript has been rewritten significantly to take the reviewers comments into account. The following changes have been made:</p> <p>1- The introduction and background has been shortened significantly and now includes</p>

	<p>only pertinent material.</p> <p>2- The Methodology has been shortened and simplified. The authors believe that should this paper be published, it would be one of very few publications which has used independent methodology to assess quality of care in healthcare (Rather than use the results of analyses by organisations like CQC). This is important as the authors hope that simplified methodology which is for benchmarking of quality of care which is accessible to clinicians practitioners and managers is the key to quality of care improvement. Otherwise all assessments of quality of care would be post-hoc and by regulatory organisations and would serve to regulate rather than improve services.</p> <p>3-The discussion has been completely re-written and is significantly longer now. It reads more like a commentary on the health and Social care act of 2012. It discusses how the health care land scape has changed including specific changes regarding regulation of quality of care. The final 2 paragraphs which discuss integrated healthcare systems have been retained as they discuss the way forward re delivery of quality services in the future.</p> <p>Specific changes: Table-2 is removed as it does not add significantly to the paper and the data is also presented in figure-2.</p> <p>Figure-1 is removed as this figure also appears in the recent paper published by us in your esteemed journal. (Mofidi 2016).</p> <p>The authors do believe that there is room for a commentary (a separate publication) on how NHS reforms have delivered efficiency and quality improvement in NHS England. Particularly with Brexit looming and the manpower and staffing challenges that are facing the NHS today.</p>
Additional Information:	
Question	Response
Please enter the word count of your manuscript	3384

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Abstract:

Health and Social Care Act of 2012 (HSCA2012) has altered the operational and business environment within which NHS trusts in England operate. Shelford group are the leading multi-specialty NHS trusts in England. The aim of this study was to assess the impact of HSCA2012 on the quality of care provided by the Shelford group.

Annual quality of accounts produced by each of the Shelford group NHSTs for financial years FY 12-13, FY 13-14 and FY 14-15 were reviewed. The key performance indicators for each organization were collected and classified in line with NHS Quality Outcomes Framework (QOF). KPIs for the period just prior to enactment of HSCA2012 (FY12-13) were compared with the corresponding values for the period after the enactment of HSCA2012. The benchmarking model used in the study was validated against the Hospital Intelligent Monitoring Report (HIMR) used by the Care Quality Commission.

The clinical services provided by the Shelford group increased year on year by 7.5%, 6.4% and 4% respectively. In the FY14-15 Shelford group collectively provided 14,735,000 patient care episodes. There was no significant difference in the value of the KPIs before and after enactment of HSCA2012 along the 6 domains defined by the NHS-QOF. Good correlation was observed between the benchmarking method used in the study compared with the HIMR ($r^2=0.86$).

The quality of care provided by the Shelford group of NHS trusts did not change following enactment of HSCA2012.

Introduction

The structures and processes for delivery of healthcare in England have been evolving continuously in the past 30 years (Jones 2010), (Cooper 2009). These reforms have been iterative in nature (Nicoletti 2003). Health and Social Care Act of 2012 is most recent package of healthcare reforms in England (Mofidi 2016). A significant number of NHS trusts in England have reported a deterioration in their financial position following enactment of the Health and Social Care Act of 2012 (Lacobucci 2014). There has been concern that this impairment in the financial position of NHS trusts leads to the deterioration in the quality of care provided by these organizations.

The Care Quality Commission (CQC) is the regulator of health and social care in the United Kingdom. CQC collects surrogate markers of quality on a diverse range of key performance indicators (KPIs) from each healthcare provider in the United Kingdom and uses these to monitor and report the quality of care provided by each organisation (CQC 2013, Grol 2001). The Shelford group of NHS trusts are the leading NHS trusts in England. (Hawkes 2013). The quality of care provided by the Shelford group is a reflection on the conditions of NHS in England. The aim of this study was to assess the impact of HSCA2012 on quality of care provided by the Shelford group of NHS trusts.

Methods

NHS trusts in England produce annual quality accounts in accordance with the National Health Service act of 2006. This document provides the levels of clinical activity as well as the quality of Services provided by the organisation (DOH 2013). The levels of clinical activity and quality of care provided by each of the 10 members of the Shelford group of NHS trusts for the financial years 2012-13 (prior to enactment of HSCA2012), 2013-14 and 2014-15 (after enactment of HSCA2012) were collected and analysed.

Assessment of quality of care provided by the Shelford group

Quality of care was assessed using a standardized benchmarking tool. Benchmarking tools utilize key performance indicators in order to build an accurate and reproducible picture of quality of care provided (Donabedian 2005). The CQC uses the Hospital Intelligence Monitoring Report (HIMR) in order to assess whether healthcare providers meet the national standards of quality and safety (Addicott 2014). The HIMR was introduced in the 3rd quarter of 2013, after the enactment of HSCA2012 (Graf 2014, Jarman2014). Therefore, HIMR could not be used to assess quality of care before that point. HIMR was used as a gold-standard to validate the benchmarking tool designed and used for this study.

The benchmarking tool which was used in this study was inspired by the Acute Trust Quality Dashboard® (ATQD). ATQD is a benchmarking tool which was developed by East Midlands Quality Observatory, using over 50 quality indicators and performance metrics to provide quarterly reports for each NHS Trust (Gray 2011). Unprocessed quarterly values for the KPIs for the years 2012, 2013, 2014 and the first quarter of 2015 were obtained from the annual quality accounts produced by each of the 10 NHS trust. KPIs selected to construct the

benchmarking tool were those pertaining to the delivery of non-specialist care in an acute NHS trusts. The indicators were grouped into 6 domains in line with NHS Quality Outcomes Framework (Gillam 2012), (Table-1), and analysed using cross-sectional as well as time series analysis:

Cross-sectional examination: examines organisational outcomes for each quarter providing a snapshot of activities of the organisation. This involves calculating the variance (deviation) of each KPI from the mean value. In order to perform cross-sectional analysis, Z scores were calculated:

$$Z = (\text{Trust Outcome} - \text{Expected Value}) / (\text{Standard deviation for that value at the specified time})$$

The predefined value which triggers an adverse outcome for each KPI was 2 standard deviations in the undesired direction from mean value for all the acute NHS trusts in England.

Time series assess risk by examining a series of indicators over a time, detecting trends and highlights any deterioration of KPI measures before an outcome indicator reaches a threshold of concern. Using each of the available KPI values from the 12 quarters studied, time series were constructed and analysed using the Cumulative Sum method (CUSUM) as follows:

$$CUSUM_t = \text{Max}\{CUSUM_{t-1} + W_t, 0\}$$

CUSUM at time=t is the Sum of CUSUM at time=t-1 and the W_t which is the weight or Log of likelihood ratios when the weight is greater than zero (This is done so the CUSUM calculations cannot build credit by recording good results to offset against deterioration).

Validating the benchmarking tool

HIMR was considered the gold standard benchmarking tool. The HIMR risk scores for FY-2013-14 and FY-2014-15 were obtained and used for direct comparison with the corresponding values obtained from the benchmarking tool used in this study. The comparison between HIMR and the quality benchmarking tool was performed using coefficient of correlation as well as Bland-Altman analysis (Bland 1999) using direct comparison of proportional risk scores (calculated by HIMR) with the corresponding value obtained for the years 2013 and 2014 using the benchmarking tool used in this study.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences, version 23 (*SPSS, Inc., Chicago, IL*). Matched sets of quality indicators were treated as the primary units for analysis from which changes in quality measures before and after enactment of HSCA2012 were compared. Benchmarking scores were considered continuous variables and were compared using a paired student t-test. Man-Whitney test was used to compare non-parametric variables. The number of at risk indicators for each of the 6 domains of NHS-QOF before and after enactment of HSCA2012 were compared using χ^2 test.

Results

The Shelford group NHSTs provided 13,197,281 patient care episodes in the FY2012/13, 14,188,708 in FY2013/14 and 14,735,000 in FY14/15. representing annual increases of 7.5% 6.4% and 4% in levels of clinical activity respectively.

Validation of the benchmarking model for assessment of Quality of care

A close correlation was observed between HIMR percentage risk-score and the corresponding value from the benchmarking model used in this study (Figure-1A). Bland-Altman analysis revealed a high degree of agreement between the HIMR and the benchmarking model used in this study (Figure-1B).

Assessment of Quality of care

Domain-1 Preventing People from dying prematurely

This domain includes 4 different KPIs and is the final arbiter of how care is provided by acute hospitals. Figures 3A to D illustrate progression of each KPI over 12 quarters (second quarter of 2012 to the first quarter of 2015) in the 10 organizations studied. There was no significant difference between Standardised mortality ratios (SMR)s before and after enactment of HSCA2012, ($P=0.65$). Similarly with regards to mortality for low-risk conditions, ($P=0.74$), (Figure-3B) and in-hospital crude mortality rate for high-risk conditions (Cardiovascular, Respiratory, Liver disease) in under 75 year olds ($P=0.77$), (Figure-3D) no differences were observed between the period before HSCA2012 and the two years after the enactment of HSCA2012.

Perinatal mortality is a complex KPI. Its absolute value depends on a range of variables including the complexity of cases treated in each organization. There was a small but significant reduction in perinatal mortality between the year before [mean: 7/1000 births (standard deviation: 1.85)] and the 2 years immediately after enactment of HSCA2012 [mean: 6.15/1000 births (standard deviation: 1.85)], ($P=0.045$), Figure-3C). Prior to enactment of HSCA2012 out of 156 available KPI data points in domain-1, 6 were considered adverse outcomes following enactment of HSCA2012 out of 312 available KPI data points 14 were adverse outcomes ($\chi^2=0.42$, $P=NS$).

Domain-2 Enhancing Quality of life for patients with long-term conditions

Many patients in acute hospitals suffer from long-term conditions which are not amenable to cure. Transforming care of these patients is critical to delivering better quality of services (Gillam 2012). Table-2 lists the mean value (standard deviation) of each of these KPIs before and after HSCA2012. There was a significant increase in the incidence of admissions in patients with dementia no significant difference was observed in the value of other domain-2 key performance indicators. Prior to the enactment of HSCA2012, 38 out of 360 available KPI quarterly data points registered a risk compared with 49(out of 720) after HSCA2012. This difference was not statistically significant ($\chi^2=1.82$, $P=0.18$).

Domain-3 Helping patients recover from episodes of ill health

Re-admissions to hospital soon after a period of hospital stay are surrogate markers of post-treatment complications. It may also indicate that care was not adequately planned or that the patient has not been given adequate support for self-care(Gillam 2012). Table-3 lists the mean value (standard deviation) of each of these KPIs before and after HSCA2012. There was no

significant difference in the incidence of at risk indicators in this domain before and after the enactment of HSCA2012 ($\chi^2=1.08$, $P=NS$). Figure-4 illustrates the quarterly trends in 2 representative KPIs in this domain.

Domain-4 Ensuring that patients have a positive experience of their care

The focus of domain-4 relates to time to treatment. These KPIs are important as they are in public domain had have been regularly discussed in media. Traditionally inability to meet these KPIs has attracted financial penalties. Table-4 lists these KPIs before and after enactment of HSCA2012. Assessment of quarterly results revealed a small but significant difference in one of these indicators (accident and emergency 4 hour wait); no significant difference was seen in the rest (Table-5). There was no difference in the number of domain-4 at risk indicators before and after enactment of HSCA2012 ($\chi^2=2.44$, $P=0.15$).

Domain-5 Caring for people in a safe environment

Patient safety is very important attribute of any healthcare organization. Table-6 lists these KPIs. Incidence of adverse events (venous thrombo-embolism, healthcare associated infections and pressure sores, patient harm episodes) is closely monitored by the CQC. As table-5 illustrates the quarterly incidence of these events did not increase after HSCA2012. There was a significant reduction in rate of moderate or severe patient safety incidents and increased compliance with standardized VTE assessments at the time of admission. There was no difference in the number of domain-5 at risk indicators before and after enactment of HSCA2012 ($\chi^2=1.84$, $P=0.19$).

Domain-6 Organizational context

The importance of leadership in bringing about organizational goals in acute hospitals is recognized by the NHS. Whilst there are no reliable tools for assessment of organizational attributes, efficiency by which an organization is run and the way it is perceived by its staff and staffing levels are the means by which quality of leadership in NHS trusts is assessed. This being relatively new domain it is likely to develop further. Table-6 lists these KPIs and records their mean value (standard deviation) before and after enactment of HSCA2012. There were some improvements in these indices such as in depth and quality of recording clinical activities (coding) for care episodes provided and the use of integrated palliative care pathway (addressing the needs of patients in whom their condition is not amenable to treatment). There was no difference in the number of domain-6 indicators registering risk before and after enactment of HSCA2012 ($\chi^2=1.78$, $P=0.16$).

Discussion

In today's world of Brexit Britain, the Health and Social Care Act of 2012 feels like old news. A relic from a bygone era, a time of coalition politics, when we still listened to the alternative points of view. This *alternative point of view* at that time was that HSCA2012 would privatise and eventually put pay to the NHS as we know it (Pollock 2011, Pollock 2012). The acts' critics argue that HSCA2012 has been responsible for deepening health inequalities (Hunter 2011), has led to rationing of services (Lister 2012) and worsened democratic accountability by ending provision of healthcare by the state sector (Peedell 2011 and Davies 2013). Whilst its' proponent point to opportunities for expansion of capacity and innovative practices which lead to better services through private sector investment (Le Grand 2013). Despite the dissenting nature of the opposing viewpoints, the criticisms of the initial Health and Social Care Bill (2011) did much to shape the eventual HSCA2012. HSCA2012 remains the most comprehensive set of structural changes in delivery of healthcare in England for at least 30 years and attracts similar amounts of controversy when discussed today as it did when it was introduced in April 2013 (Blumenthal). In a splendid review of the healthcare market in England following the enactment of HSCA12, Krachler et al. showed that HSCA2012 meets the most commonly accepted definitions of '*privatisation*' and is the logical progression of the process of '*marketization*' which had been gradually happening in the preceding 20 to 25 years (Krachler 2013).

Many commentators trace any deficiencies in hospital care in England back to HSCA2012. A lot has been said and written about the organisational and structural changes brought about by the HSCA2012 and participation of the private sector in the delivery of secondary and tertiary services (Speed 2013, Marshall 2014, Mofidi 2016). The provisions of HSCA2012 on quality of healthcare services in England escaped most commentators' attention. HSCA2012 was

drafted and enacted following the publication of the Francis report into the Mid-Staffordshire NHS trust and consequently contains significant provisions regarding efficacy and quality of services provided by secondary and tertiary services (Speed 2013). Amongst these were establishing NHS commissioning boards tasked with assessing the efficacy of treatments and the introduction of quality outcome frameworks for secondary care services.

The adoption of quality outcomes frameworks (QOFs) have helped consolidate evidence-based methods for quality improvement initiatives in healthcare. The use of QOFs have been associated with improvements in quality of care, reductions in mortality and hospital admissions, by creating structured clinical benchmarks which can be used to compare outcomes (Gillam 2012). Although QOFs have been perceived as a threat to professionalism and clinical autonomy of health professionals, the fact that HIMR has been designed around NHS-QOF means that all new services being commissioned and quality improvement programs need to be responsive to and designed around NHS-QOF as this will be the framework by which they will be assessed (Checkland 2010).

This study revealed no evidence of deterioration in quality of care provided by the Shelford group after enactment of HSCA2012. In fact, there were moderate but significant improvements in some of the KPIs studied. These findings were consistent throughout the 6 domains which characterize the NHS-QOF (Diley 2014). These domains are comprehensive and cover aspects of quality of care. NHS-QOF replaces the use of standardized mortality rates as the sole means of assessment of quality. Standardised mortality ratios are merely one aspect of one of the 6 domains of NHS-QOF (Mant 2001). Calculation of mortality ratios is prone to some methodological bias (Mohammad 2009). This bias is minimized if patients are stratified by age, mode of presentation and disease process (Mohammad 2009).

As one might expect, there is a positive correlation between productivity of healthcare systems and the availability of capital and labour (Wilkie 2010). Although it is possible to increase productivity through efficiency, a point is reached where the system runs close to or at maximum efficiency beyond which further attempts at cost-control or increasing productivity result in either reduced quality or generation of a funding gap (Appleby 2015). This is known as the productivity frontier (Porter 2009). When this point is reached, inevitable trade-offs between quality and cost of care would have to be made however implicit and undesirable this may be (Jones 2011). For example, it is commonly observed that bed occupancy greater than 85% leads to increased risk of hospital acquired infections, serious errors and higher mortality (Jones 2015).

Bed occupancy greater than 85% is a surrogate marker of reduced staff per patient ratios and is an indicator of a cost efficient but under resourced service (Jones 2011, 2015, 2016). Jones et al reported a close correlation between annual Summary Hospital-level Mortality Indicator (SHMI) and inpatient bed occupancy above 85% (Jones 2016). Stargardt and co-workers have examined the relationship between hospital costs and mortality from acute myocardial infarction and revealed that even following relatively modest reductions in costs there is a measurable increase in mortality rates (Stargardt 2014). No healthcare manager explicitly sets out a process of cost-control at the expense of quality, yet this does not mean that such trade-offs do not happen implicitly. If such a process is continued to its logical conclusion, the inevitable outcome is the position which Mid-Staffordshire NHS trust found itself in.

External drivers for productivity are well known and include competition, regulation and flexibility of input markets (labour and capital) (Syverson 2011, Fox 2011). Enactment of

HSCA2012 has had a significant impact on these external drivers. It has changed the competitive environment within NHS England, and created Monitor which regulates the flow of capital to the NHS foundation trusts as well as local and regional healthcare markets. Labour market is regulated by the General Medical and Nursing councils which are responsible for certification and revalidation healthcare professionals and the Royal Colleges (Physicians, Surgeons, GPs and Midwifery and Nursing) which are involved in training and workforce planning.

When it comes to reforming healthcare processes, NHS England's major leverage over secondary and tertiary care services remains commissioning (Krachler 2013). HSCA2012 abolished the primary care trusts and strategic health authorities and created Clinical Commissioning Groups (CCGs) which are staffed by general practitioners, nurses and lay members and commission (purchase) services for a geographically defined area. This arrangement heavily favours the incumbent providers which are the NHS trusts (Krachler 2013). CCGs are advised by '*Health And Wellbeing Boards*', *Monitor* (the financial regulator of NHS) and of course the CQC. The process of marketisation after enactment of HSCA2012 is characterised by a complex and fragmented regulatory environment (Krachler 2013).

HSCA2012 is only one of many challenges facing NHS trusts in this decade. In fact, almost all of the internal and external drivers for change are liable to undergo significant change. Prolonged austerity and iterative efficiencies introduced through QIPP (Quality, Innovation, Productivity and Prevention) program (HSC 2013) have reduced available capital whilst changes to medical and nursing licencing and tightening of immigration rules have effected availability of appointable staff. Under these circumstances internal drivers of productivity can only provide a temporary solution. In order to sustainably provide and maintain quality of

services transformational change is needed. Value based healthcare which has been proposed by the distinguished Harvard economist Michael Porter is an example of such change (Porter 2010).

Value-based healthcare seeks to enhance the quality of care by placing the entire cycle of disease-specific care in new organizational structures which have at their disposal all the resources required to effectively treat the condition, focusing on the value provided to the patient (Porter 2009). MD Anderson cancer center in Houston Texas reported significant improvements in cancer related outcomes and patient experience following an institution-wide reorganization to incorporate value-based principles (Pollock 2008). Recent experience with delivery of a purely integrated healthcare system in Germany suggests that in addition to the qualitative benefits, such a system is associated with significant cost savings (Hildebrandt 2012). Developing value-based solutions requires levels of coordination and collaboration between stakeholders currently lacking in NHS. Optimizing and coordinating activities of NHS trusts into a seamless process is a potential and yet untapped source of efficiency and improvement in quality of care.

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Captions for Figures and Tables:

Table-1: The 6 domains which encompass NHS Quality Outcomes Framework (Gillam 2012).

Table-2: Domain-2 KPIs assessing enhancing quality of life for patients with long term conditions mean values (standard deviations) before and after enactment of the HSCA2012 are listed as are the probability values for difference between the two for each KPI.

Table-3: Domain-3 KPIs assessing Helping patients recover from episodes of ill health. Mean values (standard deviations) before and after enactment of the HSCA2012 are listed as are the probability values for difference between the two for each KPI.

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Figure-2(A): Hospital mortality from conditions amenable to healthcare (Standardized Mortality Ratio).

Figure-2(B): In-hospital mortality in low risk diagnosis groups (per 1,000 admissions).

Figure-2(C): In-hospital perinatal mortality, including still births (per 1,000 births). Note this value is dependent on the complexity of perinatal and intensive care services provided.

Figure-2(D): In-hospital mortality rate for Cardiovascular/Respiratory/Liver disease in patients 75 years of age (per 1,000 admissions).

Figure-3: Quarterly rate of a number of domain 3 indicators. (BADs: British Association for Day Surgery)

Domain	Description	Number of KPIs
Domain-1	Preventing people from dying prematurely	4
Domain-2	Enhancing Quality of life for patients with long term conditions	8
Domain-3	Helping people recover from episodes of ill health	11
Domain-4	Ensuring patients have a positive experience of care	9
Domain-5	Treating patients in a safe environment (prevent avoidable harm)	10
Domain-6	Metrics relating to organisational development	10

Table-1: The 6 domains which encompass NHS Quality Outcomes Framework (Gillam 2012).

	Pre HSCA 2012	Post HSCA 2012	p
Emergency admissions for Ambulatory Care Sensitive Conditions	193(15.7)	198.8(16.2)	0.062
Length of Stay for emergency admissions for Ambulatory Care Sensitive Conditions	6 (1.3)	5.95(0.98)	0.83
Emergency admissions for asthma, diabetes and epilepsy in under 19 year olds	51.23(18.4)	50.75(16.1)	0.89
Length of Stay for emergency admissions for asthma, diabetes, and epilepsy	2.11 (1.1)	2.34 (0.97)	0.27
Emergency admissions for patients age 65 and over with Dementia	131.4(20.8)	140.2(19.1)	0.029
Length of Stay for patients aged over 65 admitted in an emergency with Dementia	16.57(3.08)	16.49(3.27)	0.89
Length of Stay for patients age 65 and over admitted in an emergency	11.43(2.56)	11.2(1.92)	0.6
Length of Stay for patients age 65 and over admitted for or with a fall	13.16(3.2)	12.32(3.41)	0.2

Table-3: Domain-2 KPIs assessing enhancing quality of life for patients with long term conditions mean values (standard deviations) before and after enactment of the HSCA2012 are listed as are the probability values for difference between the two for each KPI.

KPI	Pre-HSCA2012	Post HSCA2012	p
Emergency re-admissions: Percentage within 30 days of an elective admission	6.14 (0.46)	6.25 (0.68)	0.27
Emergency re-admissions: Percentage within 2 days of an elective admission	0.79 (0.15)	0.83 (0.15)	0.16
Emergency re-admissions: Percentage within 30 days of a non-elective admission	12.21 (1.72)	12.43 (2.05)	0.54
Emergency re-admissions: Percentage within 2 days of a non-elective admission	2.29 (0.27)	2.34 (0.28)	0.32
Average Length of Stay for elective admissions	3.55 (0.65)	3.59 (0.66)	0.76
Average Length of Stay for non-elective admissions	5.75 (1.03)	5.8 (0.92)	0.82
Patient Reported Outcome Measures for primary hip replacement (Adjusted average health gain)	21.39 (0.69)	21.65 (1.17)	0.15
Patient Reported Outcome Measures for primary knee replacement (Adjusted average health gain)	15.56 (1.43)	15.57 (1.00)	0.78
BADS Day Case Rate	68.6 (6.84)	69.6 (6.9)	0.25
Day-case to Inpatient Conversion Rate	4.54 (0.98)	4.65 (0.99)	0.6
Fractured Neck of Femur: Percentage operated on within 48 hours	76.2 (11.64)	78.3 (9.12)	0.33

Table-3: Domain-3 KPIs assessing Helping patients recover from episodes of ill health. Mean values (standard deviations) before and after enactment of the HSCA2012 are listed as are the probability values for difference between the two for each KPI.

KPI	Pre-HSCA2012	Post HSCA2012	p
Friends and Family Score: In-Patient	NA	94.94 (2.48)	NA
Friends and Family Score: Accident & Emergency	NA	88.67 (3.87)	NA
A&E 4hr Wait (Percentage seen within 4 hours)	95.7 (2.14)	94.5 (1.93)	0.02
Diagnostic waits: Percentage of patients waiting over 6 weeks	90.4 (3.55)	89.75 (3.42)	0.34
Inpatient Referral to Treatment (RTT): Percentage of patients seen within 18 weeks	90.5 (3.1)	89.75 (3.42)	0.26
Cancellations of elective surgery for non-clinical reasons (rate per 1,000 procedures)	7.99 (3.44)	9.15 (4.48)	0.12
Cancer waits: Percentage with first out-patient appointment within 14 days of referral	95.94 (1.52)	95.94 (1.79)	0.91
Cancer waits: Percentage waiting less than 31 days from diagnosis to first treatment	97.38 (2.39)	97.34 (1.55)	0.93
Cancer waits: Percentage waiting less than 62 days from GP referral to first treatment	84.7 (6.77)	83.2 (65.42)	0.22

Table-4: Domain-4 KPIs before and after enactment of HSCA2012.

KPI	Pre-HSCA2012	Post HSCA2012	p
Patient safety incidents (Crude rate per 100 admissions)	7(3.15)	7.78(3.48)	0.22
Patient safety incidents causing at least moderate harm (Proportion of all incidents reported)	6.34 (3.77)	3.28(1.91)	0.008
Never Events (Crude rate per 1,000,000 bed days)	NA	1.94 (1.12)	NA
		97.78	
Harm free care: Percentage of patients with no harms recorded	NA	(0.98)	NA
Pressure ulcers: Percentage of patients with a newly acquired pressure ulcer (category 2,3 and 4)	NA	0.89 (0.4)	NA
Percentage of patients with a hospital acquired VTE	NA	0.54 (0.29)	NA
VTE Assessments: Percentage of patients undergoing a VTE assessment on admission	88.4 (8.41)	95.1 (2.4)	0.01
Medication errors (Crude rate per 1,000 bed days)	8.9(3.1)	10.0(3.3)	0.067
		16.48	
MRSA bacteraemia (Crude rate per 1,000,000 occupied bed days)	14.4 (12.1)	(12.9)	0.39
Clostridium difficile infection (Crude rate per 100,000 occupied bed days)	21.8 (8.04)	19.1 (7.66)	0.08
MSSA bacteraemia (Crude rate per 100,000 occupied bed days)	10.3 (4.48)	10.4 (4.45)	0.9

VTE: Venous Thrombo-embolism

Table-5: Domain-5 KPIs before and after enactment of HSCA2012.

KPI	Pre HSCA2012	Post HSCA2012	p
Depth of coding: Mean number of secondary diagnoses	3.15(1.23)	3.53(0.43)	<0.0001
Mean Charlson co-morbidity score	3.5(1.1)	3.47(0.88)	0.88
Proportion of palliative care episodes (ICD10: Z515) per 1,000 episodes	5.41(1.86)	6.67(1.66)	0.0006
Proportion of episodes with palliative medicine as main specialty per 1,000 episodes	0.25(0.63)	0.25(0.62)	0.94
Use of integrated palliative care pathway: Proportion of episodes with diagnosis Z518 per 1,000 episodes	2.01(0.82)	3.35(1.08)	0.018
Full Time Equivalent (FTE) nurses per occupied bed day	2.27(0.21)	2.25(0.2)	0.54
Full Time Equivalent (FTE) medical staff per occupied bed day	0.94(0.24)	1.01(0.24)	0.26
Overall sickness: Percentage of Full Time Equivalent (FTE) days available	3.69(0.68)	3.62(0.7)	0.56
Staff recommendation of the trust as a place to receive treatment (Percentage)	74.3(9.04)	74.7(8.63)	0.85
Staff recommendation of the trust as a place to work (Percentage)	63.3(7.5)	66.74(6.9)	0.86

Table-6: Key Performance Indicators relating to organizational development before and after enactment of HSCA2012.

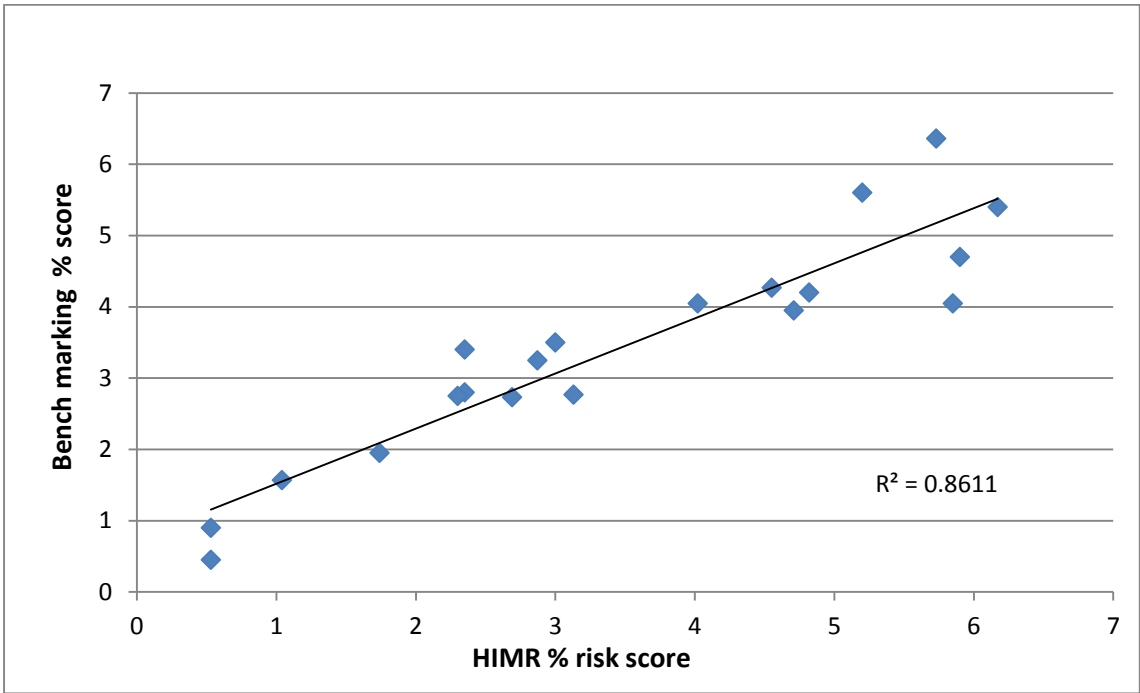


Figure-1A: The correlation between HIMR % risk and the benchmarking risk score used in this dissertation

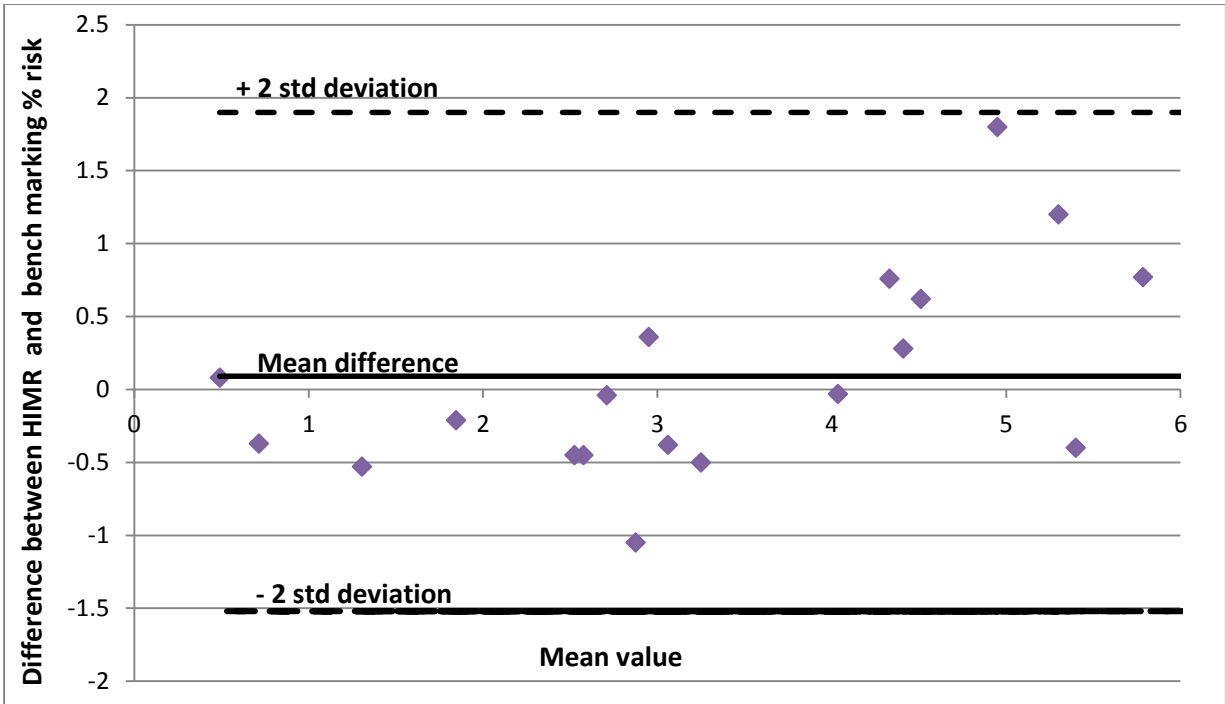


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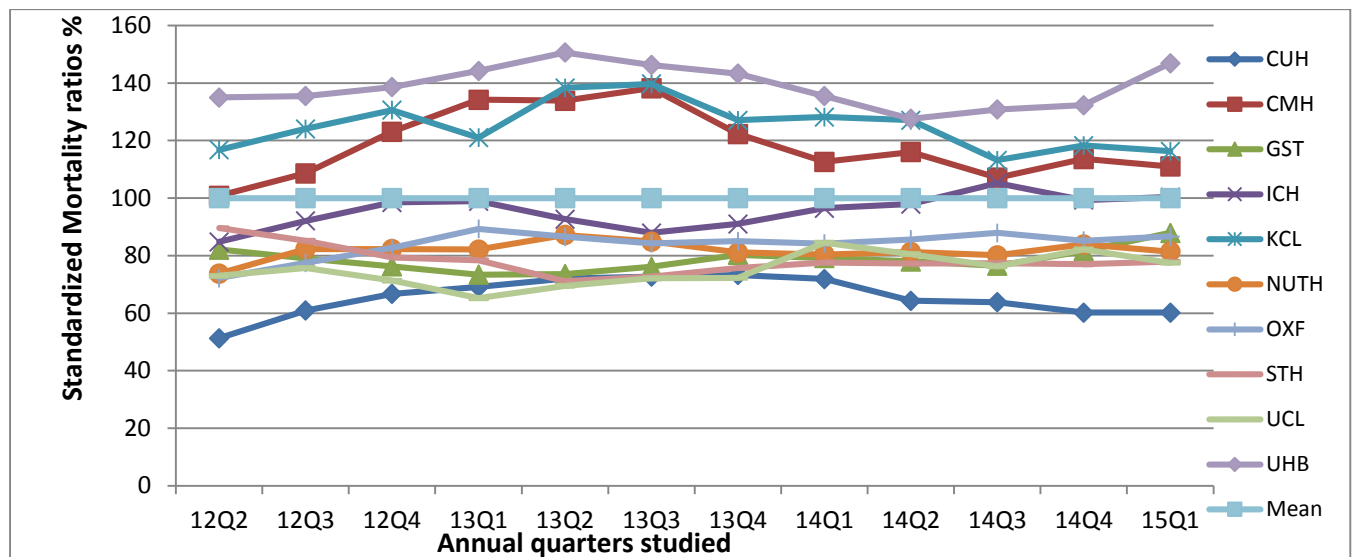


Figure-2(A): Hospital mortality from conditions amenable to healthcare (Standardized Mortality Ratio).

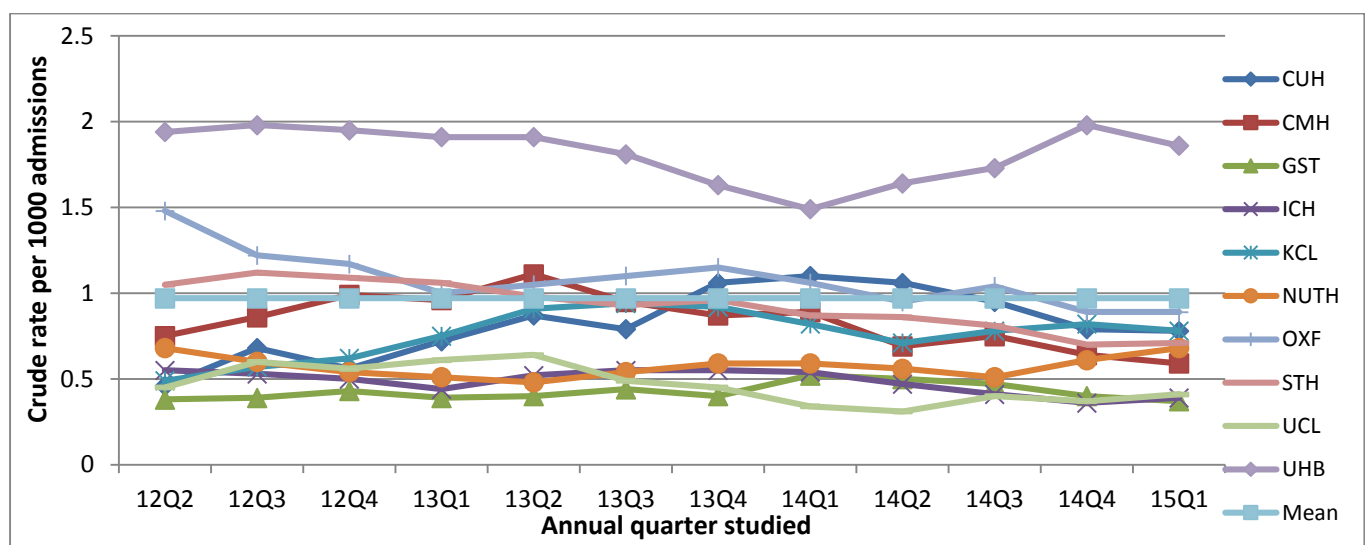


Figure-2(B): In-hospital mortality in low risk diagnosis groups (per 1,000 admissions).

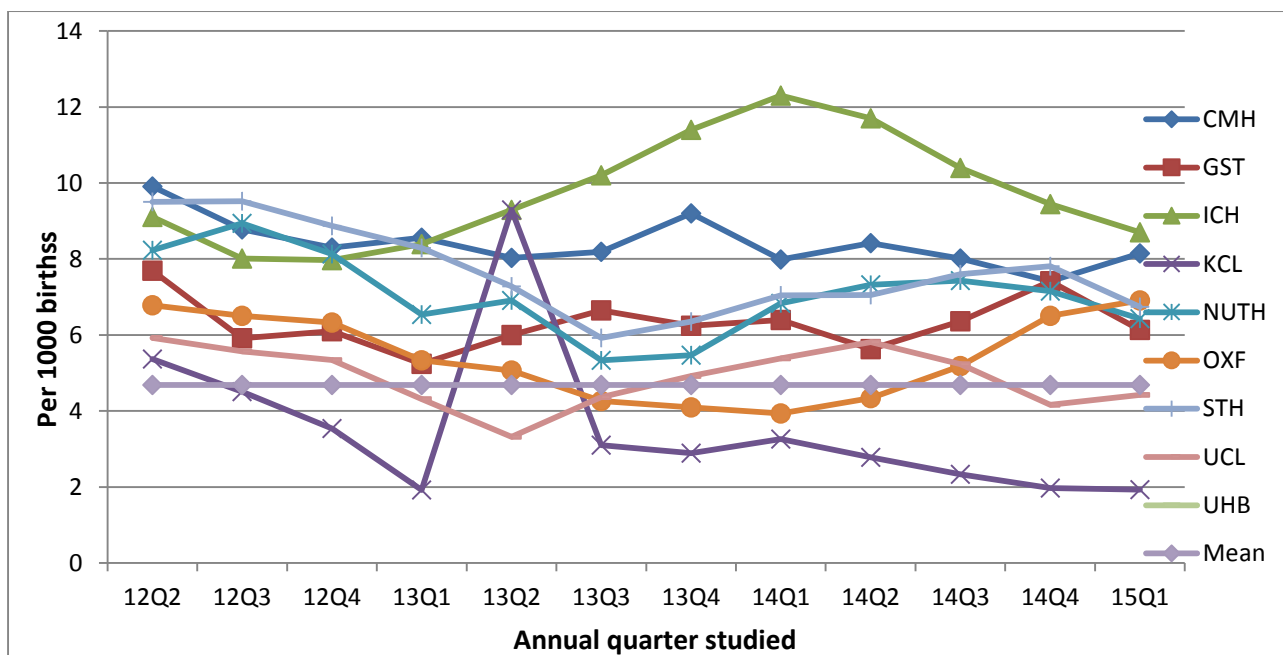


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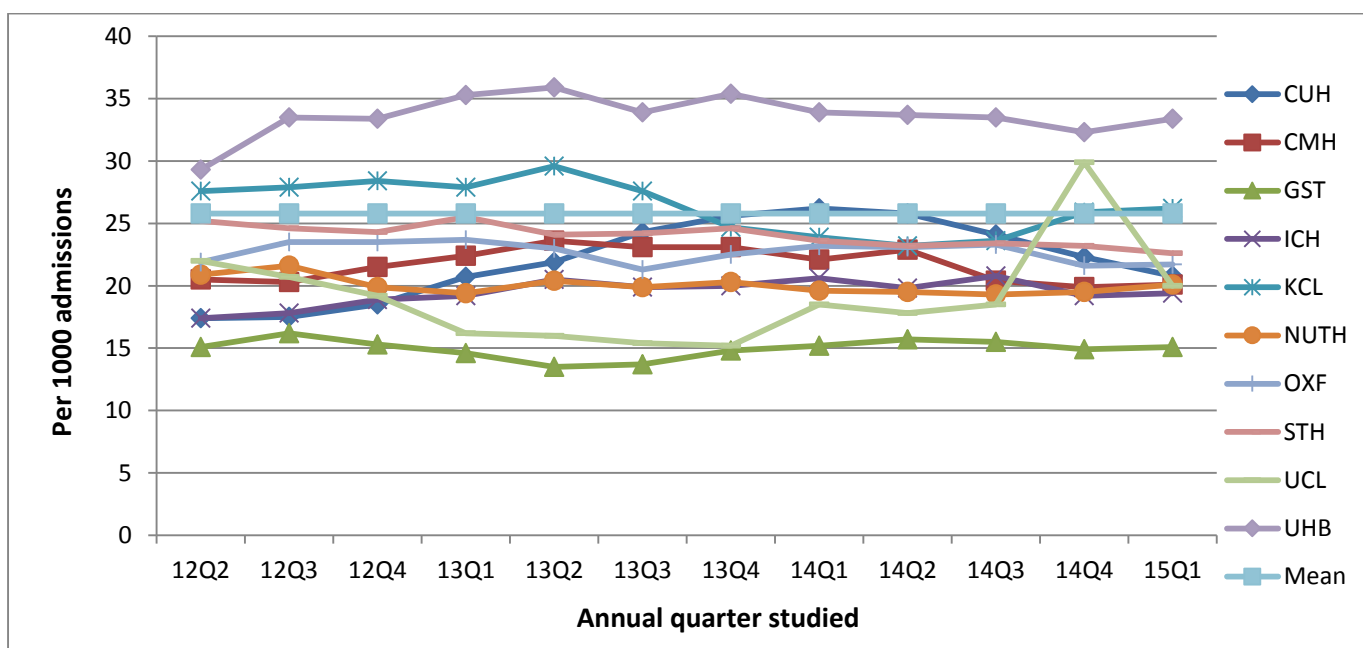


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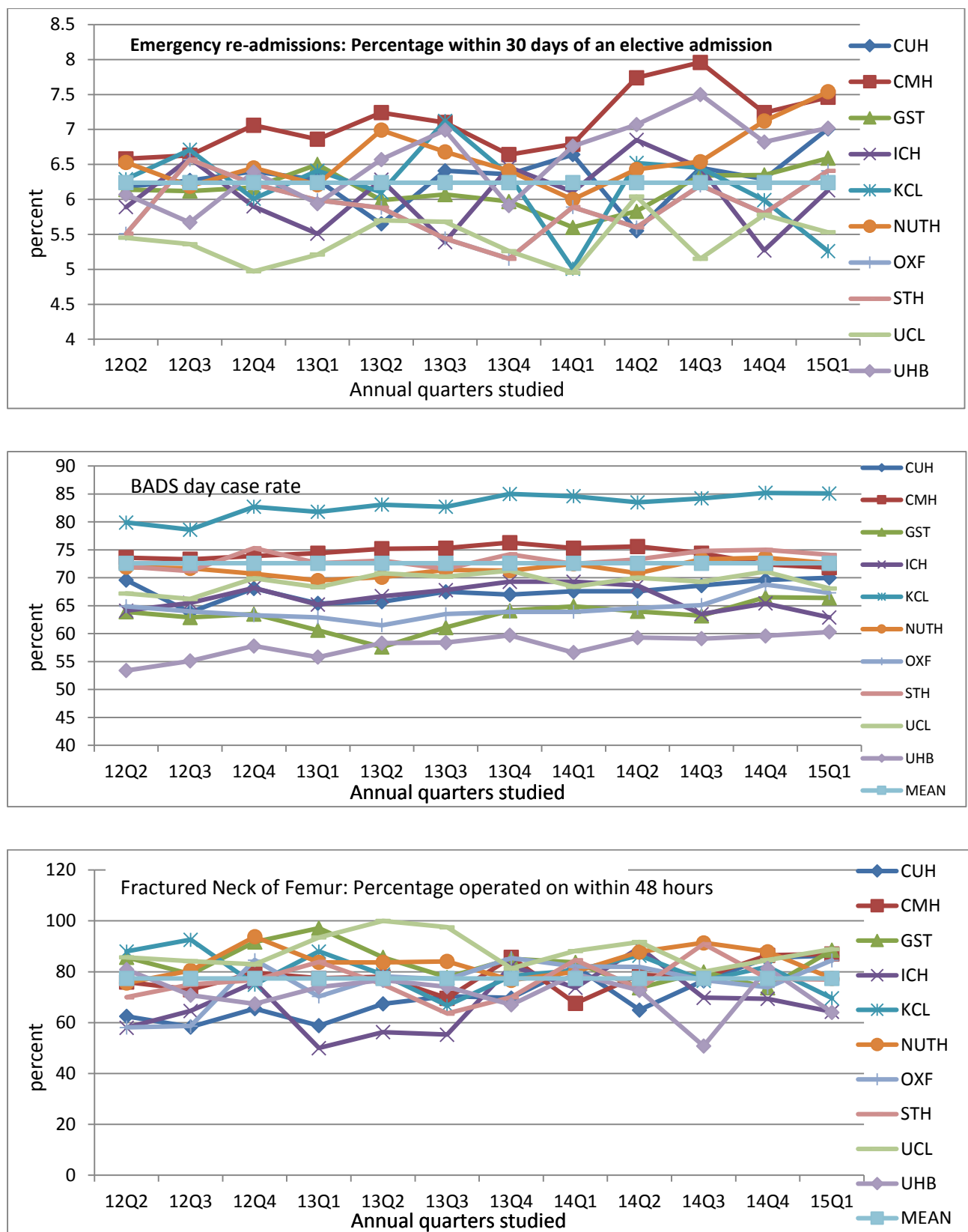


Figure-3 Quarterly rate of a number of domain 3 indicators. (BADS: British Association for Day Surgery)