

Determinants of Quality of Care for NHS England and the effect of the Covid-19 pandemic

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Abstract

Quality of care is the number one priority of hospitals for NHS England, and patient experience is at the heart of the quality-of-care indicators. The aim of this paper is to study the significance of quality-of-care determinants before and during the Covid-19 pandemic. Using data for 2019 and 2020, this study finds that the number of A&E attendances and the number of cancer patients waiting for 62 day+ for the first treatment are significant determinants of quality of care for both years. It also finds that the number of Covid-19 cases in hospitals is not significant to patient experience aspect of quality of care.

This study investigates the multifaceted relationship between hospital operational metrics and patient satisfaction within NHS England, focusing on the determinants of quality of care in 2019 and 2020, before and during the COVID-19 pandemic. The research examines five key factors—procedure waiting times, cancer treatment delays, A&E attendances, bed occupancy rates, and reported safety incidents—assessing their collective impact on patient complaints as indicators of healthcare quality. By employing a linear regression approach, the study provides a comprehensive analysis of how operational pressures and safety concerns correlate with patient complaints, offering insights into potential improvement areas within NHS hospitals.

The results reveal that prolonged cancer treatment waiting times and increased A&E attendances are strongly associated with higher complaint volumes, pinpointing critical operational areas requiring attention to enhance patient care and satisfaction. Additionally, findings suggest that the pandemic temporarily influenced complaint levels, likely due to heightened public awareness and tolerance for the NHS's constraints. Conversely, the impacts of bed occupancy and safety incidents on complaints were variable, emphasizing the complex drivers of patient dissatisfaction during a healthcare crisis. This study underscores the importance of adaptive resource allocation, enhanced patient communication, and expectation management, especially under increased healthcare system pressures. These insights contribute to existing literature by highlighting an integrated approach to identifying and addressing the determinants of quality care in public healthcare institutions.

Keywords

Quality of care; hospital performance; patient complaints; Covid-19; NHS.

1. Introduction

Organisations including hospitals use performance measurement systems to measure and improve the results of their activities. In the case of hospitals, performance measurement systems are used to improve the quality of care provided to the patients. Previous studies such as Kroening et al. (2015) and Van Dael et al. (2021), have studied the quality of care focusing on patient complaints because written complaints serve as crucial indicators of healthcare quality. They studied waiting times or emergency department attendance separately, yet they have not sufficiently addressed how a combination of these factors can collectively impact the quality of care. Because those studies examined the influence of only one or two determinants, there is limited research offering a holistic analysis that integrates multiple operational and safety factors and helps to determine what are the most influential ones. Obtaining a more complete understanding of these factors would enable hospitals to improve hospital performance and better address systemic issues such as the COVID-19 pandemic, which drastically altered healthcare dynamics. Given the significant changes in healthcare demand and delivery brought on by the pandemic, there is a need to assess if the relevance of the determinants of quality of care has changed and how.

This research contributes by providing a more comprehensive analysis of the determinants of quality of care in NHS England, studying patient complaints in 2019 before the Covid-19 pandemic and in 2020 after the covid-19 pandemic. By examining five different factors and employing a linear regression approach, this study offers new insights into if and how operational pressures and safety concerns drive the number of written complaints. It also provides evidence on if and how Covid-19 pandemic impacts the relevance of those factors. The study's findings can inform targeted strategies that hospitals can use to improve service delivery and patient satisfaction, addressing a gap in the literature by offering a more integrated view of the elements influencing healthcare quality.

This research is particularly relevant and important within the public sector due to the significant role healthcare quality plays in public service accountability and resource allocation. In publicly funded healthcare systems like NHS England, patient complaints are not just indicators of service quality, but also of public trust and institutional legitimacy (Bevan and Hood, 2006). The ability of healthcare organizations to respond to complaints is directly tied to their capacity to meet patient expectations and maintain public confidence. Additionally, the COVID-19 pandemic has placed unprecedented pressures on the NHS, leading to increased scrutiny of healthcare delivery and heightened public expectations for transparency and responsiveness (Mannion and Braithwaite, 2012). Understanding the factors that lead to patient dissatisfaction in such a critical public service can support policymakers and healthcare administrators in making evidence-based decisions that improve patient outcomes while ensuring efficient use of public resources (Smith et al., 2015). This study, by examining multiple determinants of patient complaints, contributes to the broader public sector discourse on accountability, efficiency, and service quality, offering valuable insights that are directly applicable to the management and improvement of public healthcare institutions.

The structure of the article is as follows. Section 2 includes a review of the literature on hospital performance and quality of care and develops hypothesis about the determinants that may influence quality outcomes. Section 3 presents the research method including the sample selection, the variables measurement and the empirical strategy for the data analysis. Section 4 contains the empirical findings. Section 5 discuss the findings in the context of healthcare management and policy, present limitations and future research suggestions and concludes.

2. Literature Review and Hypothesis Development

2.1 Hospital performance and quality of care

The National Health Service (NHS) is a very distinctive organisation. Established in 1948, the National Health Service is one of the world's largest public healthcare institutions. In England, healthcare is free at the point of use as the taxpayers fund it. As a result, the NHS users have high expectations about the quality

of care they would like to receive because they regard themselves as the "custodial guardians" (Public Services Ombudsman, 2020).

One prominent approach to hospital performance measurement is the use of key performance indicators (KPIs) across multiple domains. According to the literature, these domains typically include clinical effectiveness, patient safety, patient experience, and operational efficiency (Kirkpatrick et al., 2017). For example, KPIs related to clinical effectiveness may focus on outcomes such as mortality rates, readmission rates, and adherence to evidence-based clinical guidelines (Purdy et al., 2019). Patient safety indicators assess the occurrence of adverse events, healthcare-associated infections and medication errors (Vincent et al., 2019). Patient experience metrics capture aspects such as satisfaction with care, communication with healthcare providers, and involvement in decision-making processes (Doyle et al., 2013). Operational efficiency indicators evaluate resource utilization, waiting times, and throughput within hospital settings (Mannion et al., 2015).

NHS England measures its hospital performance with four main type of indicators which are: mortality rates, weekly A&E performance, patient experience and safe staffing levels. The importance of patients' experience is thus at the heart of the NHS hospitals key performance indicators. The NHS collects service users' patients experience data in several forms, such as the friends and family tests, frequent inspections by the Care Quality Commission (CQC) as well as written patient complaints data.

Each year, the NHS receives on average 200,000 formal written complaints and the figure has been constantly increasing (van Dael et al., 2020). The significance of the NHS complaints has been subject to great debate. On the one hand, some studies have seen the number of complaints as an indicator of issues and problems in the healthcare system (McCreddie, Benwell and Gritti, 2018). On the other hand, other studies have stated that they may reflect unrealistic expectations of NHS service users about their quality of care (Lacobucci 2019).

Most importantly, patient complaints provide great insights into the patient experience and may also highlight potential problems. Therefore, they play an essential role in indicating areas for improving the quality of care. According to the Parliamentary and Health Service Ombudsman Report (2013), for example, a great emphasis is given to the number of written complaints to improve patient safety. Studies like Kroening et al. (2015) suggest that the number of patients complaints may indicate patients' safety incidents because they can potentially provide early warnings or red flags in the system. If those were acted upon quickly enough, they would more likely prevent the occurrence of serious safety incidents. However, further research is needed to determine how the number of complaints can be used to predict future safety incidents.

For the purposes of this study, the patient experience aspect of the quality of care is measured with the number of written complaints received by NHS hospitals.

2.2. Determinants of quality of care

Several studies have investigated the relationship between patient complaints and quality of care indicators, highlighting how patient feedback can serve as a valuable tool in assessing healthcare performance. For instance, research by Bismark et al. (2013) identified that patient complaints often correlate with clinical outcomes and can serve as early warnings for potential safety issues. Similarly, Reader et al. (2014) found that frequent complaints were associated with lower quality care metrics, such as increased hospital readmission rates and higher incidence of medical errors. These studies underscore the importance of patient complaints as indicators of broader systemic issues in healthcare quality and safety.

Previous studies focusing on the NHS have examined the volume and nature of patient complaints, as well as the factors influencing them. For example, a study by Coulter et al. (2014) explored the reasons behind patient dissatisfaction in the NHS, identifying key elements such as communication breakdowns, delays in treatment, and perceived staff attitudes as primary drivers of complaints. Additionally, Reader et al. (2014) reviewed patient complaints across various NHS trusts along with other hospitals from around the world, finding that the frequency of complaints was often linked to operational pressures like staff shortages and high bed occupancy rates. These studies highlight that patient complaints in the NHS are influenced by a

complex interplay of factors, including organizational efficiency, staff-patient interactions, and the accessibility of services.

Prior studies have primarily investigated the significance of one or two factors on the number of complaints, such as Kroening et al. (2015) who focused on communication quality, and Van Dael et al. (2021) who examined waiting times. This study contributes to this line of research by extending the set of determinants of quality of care to include the number of cancer patients waiting 62+ days for their first treatment, the number of patients waiting 13+ weeks for diagnostic tests and procedures, the number of A&E attendances, the rate of overnight bed occupancy, and the number of reported safety incidents. By incorporating these diverse factors, this study provides a more holistic view of the elements that can explain variations in the quality-of-care patients receive. Additionally, the study controls for the years 2019 and 2020 to assess the impact of COVID-19 on these variables. The inclusion of the number of COVID-19 cases allows for an understanding of the extent to which hospitals faced pressure during the pandemic, differentiating between those with high versus low COVID-19 burdens.

2.2.1 Procedure and diagnostic patients' waiting time (13 weeks +).

Studies have demonstrated that extended waiting times for procedures and diagnostic tests are common in many healthcare systems worldwide (Bleustein et al., 2014 and Bielen and Demoulin, 2007). According to the literature, waiting time is an important element of patient experience in healthcare settings. One of the many factors that may influence patient complaints is waiting time for procedures and diagnostic tests. Longer waiting times were found to be linked to increased risk to patient safety and health effects (HSE National Inpatient Experience Survey Reports, 2019). The waiting times include the time patients spend waiting for consultations, appointments, diagnostic tests and procedures. This study will measure this waiting time using the 13 weeks' time scale instead of other lower ones because that it is the most prolonged waiting time frame in NHS data sets.

Research revealed patients often perceive excessive waiting times as indicators of a lack of efficiency, care, and sometimes a disrespect for patient time and well-being (Nottingham et al., 2018). Another study by Gagliardi et al. (2021) highlighted that prolonged waiting times for procedures not only increases patient anxiety and discomfort but also impede timely access to care, potentially compromising patient outcomes. According to the UK Health Foundation since July 2023, waiting lists for routine procedures have reached 7.68 million. In 2023, the national inpatient experience survey showed that an increasing number of patients have felt that they had to wait too long for their routine treatment and that 40% of those felt that their health condition has worsened before being admitted to hospital. This suggests that waiting time can prolong diagnostic uncertainty, leading to heightened patient distress and dissatisfaction. Reader et al. (2014) found a significant correlation between prolonged waiting times for procedures and diagnostic tests and heightened patient complaints. Patients may file formal complaints against healthcare facilities, citing delays in receiving timely care as a primary concern. Therefore, based on previous studies (Reader et al., 2014 and Gagliardi et al., 2021), we expect a positive correlation between the number of patients waiting for 13 weeks+ for diagnostic tests and procedures and the number of written complaints the hospital receives.

It is important to recognise that the psychological impact of waiting is driven by the lack of clear information about delays. Providing transparent information about wait times can help to mitigate patients' anxiety, making the waiting period more manageable and less likely to result in complaints.

Hypothesis 1: The higher is the number of patients waiting for 13 weeks+ for diagnostic tests and procedures, the higher is the number of written complaints the hospital receives.

2.2.2 Cancer patients' 1st treatment waiting time (62 days +).

Patient satisfaction is a crucial factor of patient-centred care and quality of care. It is believed that lower waiting times lead to better patient satisfaction (Mathews, Ryan and Bulman, 2015). One of the aims of this study is to find whether delays in receiving the first cancer treatment are a significant determinant of the number of written complaints. According to NHS standards, there is a maximum of 62 days wait across all

three major channels to refer cancer patients for their first treatment. Those are counted either from the day of an urgent referral for suspected cancer, or the day of a cancer screening service, or finally from the day of the consultant's decision to start on cancer treatment.

On average, for cancer treatment in July 2019, 85.8% of cancer patients in the UK received their first treatment within 62 days after the diagnosis across all three referral channels. In July 2020, however, only 25.4% of patients received their first treatment within the NHS screening referral channel. In contrast, the 85% average figure was still maintained in the two other referral streams (NHS cancer Patients Data, 2019 and 2020). Cancer Research UK reported that there were severe delays in the screening services during the first Covid-19 lockdown because screening staff were urgently needed to help in critical care in response to the rise in Covid-19 Intensive Care Unit hospital admissions. According to Papautsky and Hamlish (2020), 44% of surveyed cancer survivors reported delays in treatment, cancer surgery and testing during the pandemic.

Lowering waiting times for cancer patients has been a priority for many healthcare systems, primarily because of the urgency of the cancer patient, since increased waiting times are often associated with an increased risk of mortality and an increase in the severity of the disease (Willis et al., 2015). A 2020 study by Hanna et al. suggests that a delay of four weeks for cancer treatment leads to an increased risk of mortality across 7 types of cancers, and that improvement in waiting times for cancer patient treatment is likely to increase survival outcomes.

According to NHS in England Interim Report from the NHS National Medical Director 2019 report, the current standard for cancer treatment is a 62 day (two months) maximum waiting time for cancer patients to receive the first treatment. Hence, this study uses the 62 days+ time frame. Mathews, Ryan and Bulma (2015) interview-based study found that the timeliness of access to care as a cancer patient was one major factor that shaped the patient experience. Therefore, we can expect that a cancer patient is more likely to complain if the wait stretches beyond the pre-set standards of care. Therefore, this study considers this variable as a possible significant determinant of the quality of care.

Hypothesis 2: The higher is the number of Cancer patients waiting 62+ days for first treatment, the higher is the number of written complaints the hospital receives.

2.2.3 Number of A&E attendances.

In the UK, A&E attendances have an annual growth rate of 2.1%, equivalent to almost 500,000 A&E additional attendances each year (NHS Digital 2018/ 2019). Data from the US Health Service Executive (HSE) suggest that long waiting times are one of the top reasons for complaints in the A&E patient population. Crowding in the emergency department is a major safety concern as it often indicates poor quality of care. A systematic review study (Carter, Pouch and Larson, 2014) found that three out of 11 papers reported a positive relationship between mortality and crowding in the emergency department; a further five studies found a positive relationship between crowding in the emergency department and patients who check in and go through triage A&E department but leave without being seen by a doctor. This highlights the importance of crowding in A&E and how it can negatively impact the quality of care (Carter, Pouch and Larson, 2014).

Studies such as Saxon et al. (2013) showed that as new patients check in to the emergency department, it increases the waiting time for triage by a further 10 minutes for each hour and that waiting time keeps increasing as more patients check in to the A&E. So theoretically, an increase in the number of A&E attendances will lead to busier emergency rooms and elevate the waiting time which increases the risk of patients leaving without access to care, which will result in more complaints. Therefore, we expect that the higher the number of A&E attendances the higher the number of patient complaints.

Based on the evidence of another study (Ghaffar and Garlapati, 2020), the number of A&E attendances during the first COVID-19 lockdown in the UK had a noticeable general decrease, as the number of COVID-19 infections increased, due to public fears about catching the virus. Therefore, we can expect to find fewer patients accessing the A&E department in 2020 in comparison to 2019, and consequently a lower number of patient complaints.

Hypothesis 3: The higher is the number of A&E Attendances, the higher is the number of written complaints the hospital receives.

2.2.4. Overnight beds occupancy rate (BOR).

Prior studies in the NHS, such as Bosque-Mercader and Siciliani (2023) and Keegan (2010), investigated the impact of bed rate occupancy rate covering periods up until 2018. These studies found that a high BOR leads to a higher mortality rate, which indicates lower quality of care.

According to NHS England, the average overall hospital bed occupancy rate (BOR) from 2016 to 2019 stood at around 91.7%. Furthermore, in 2018/ 2019, across 35 NHS England Trusts, the BOR reached an alarming rate of 95%, which is 10% more than the safe level (85%). Chris Hopson, the chief executive of NHS Providers, expressed his concerns over the high BOR levels and their impact on the ability of the Trusts to deliver care to patients in a safe and timely manner. In addition to that, a high BOR negatively impacts the handling of elective and emergency hospital admissions, increases the risk of cross infection because of overcrowding in wards, and it adversely affects hospital staff well-being and increases the risk of burnout. Therefore, we expect that a high BOR decreases hospital's overall efficiency, leading to lower quality of care, and hence more patients written complaints.

Due to the COVID-19 pandemic, BOR in England has decreased to an average of 85% in 2020 (www.kingsfund.org.uk). This decrease resulted from the cancellations of all routine operations and treatments that required a hospital stay. Therefore, we can expect to find lower BOR in 2020 in comparison to 2019, and consequently a lower number of patient complaints.

Hypothesis 4: The higher is the number of overnight bed occupancy, the higher is the number of written complaints the hospital receives.

2.2.5 Number of reported safety incidents.

The number of safety incidents reported by NHS staff is the last determinant investigated in this study. One in twenty NHS patients experiences preventable harm (Panagioti, 2019). Every year the NHS staff records just over 2 million reported safety incidents involving patients admitted to hospitals. These are classified according to the degree of harm: low, moderate and severe (NHS NLRs Data, 2020) and when there are harmed patients, they are more likely to complain. This study found more than 46% of the patients' complaints were linked to reported safety incidents which involved patient harm (Hickson et. al 2002). This significant finding highlights the critical need for improving patient safety measures to reduce harm and enhance the overall quality of care.

Another study (Gillespie and Reader, 2016) suggest that patient complaints information may be used as an early warning system, to predict future patient safety incidents and it finds that this information is not considered sufficient to do so. Hence, in this study, we refer to the current number of reported safety incidents, and not to the future number of incidents.

Due to the COVID-19 pandemic lockdown in 2020 limiting patients' access to hospitals, we expect a lower number of safety incidents reported by staff in 2020 than in 2019, and consequently a lower number of patient complaints.

Hypothesis 5: The higher is the number of reported safety incidents, the higher is the number of written complaints the hospital receives.

2.3 Control variables

NHS Trusts are public sector bodies established by parliamentary order by the secretary of state for health to provide healthcare services to the NHS. They have a board with executive and non-executive directors and are accountable to the secretary of state. NHS Trusts are expected to become foundation trusts in due course,

and are performance managed by the NHS Trust Development Authority (TDA) on behalf of the secretary of state to support them in this transition.

NHS Foundation trusts have a legal duty to maximise the public benefit derived from the organisation, providing, and developing healthcare according to the core values of the NHS. They go through a rigorous approval process, after which they have greater freedom than NHS Trusts to work with their local communities and design their services around local needs.

Therefore, this study will control for Foundation Trust Hospital status to see if their more centralised and more local community-focused decision-making, and extra financial and managerial freedom, has a positive impact on the number of complaints. For this reason, we expect that Foundation Trust Hospitals will have a lower number of complaints, and ultimately higher quality of care compared to NHS Trust hospitals.

To consider the impact of Covid-19, this study will control for the number of Covid-19 cases recorded by the NHS hospitals. We expect that the higher is the number of Covid-19 patients in the hospital the higher will be the number of patient complaints. The reason is that the sudden influx of Covid-19 patients has led to strained resources and significant challenges in maintaining the quality of care. A study published in 2021 highlights that during the pandemic, the mortality rates for non-Covid-19 conditions increased, suggesting that the quality of care for these conditions suffered because of the pandemic-related pressures (Bodilsen et al., 2021). In addition, elective surgeries and routine procedures were postponed opening capacity for Covid-19 patients. This led to longer waiting times and, in some cases, deteriorations in patient conditions while waiting for treatment. According to the King's Fund report, the pandemic exacerbated existing pressures on the NHS, leading to significant backlogs in care and increased waiting times for treatments (www.kingsfund.org.uk). Additionally, NHS England statistics suggest the number of patients waiting more than 52 weeks for treatment surged from 1,613 in February 2020 to 192,169 by November 2020, illustrating the significant delays in care. Therefore, The Covid-19 pandemic placed unprecedented pressure on the NHS, leading to a reallocation of resources towards Covid-19 care and significant disruptions in the delivery of routine and elective healthcare services. This situation resulted in a measurable decline in the quality of care.

This study controlled for the years 2019 and 2020, to examine the impact of Covid-19 on the variables. The number of Covid-19 cases will help us establish to what extent in that situation the hospital had a lot of pressure for covid or no pressure since hospitals with a lower number of Covid cases were under less pressure compared to the ones with a higher number of Covid cases.

3. Method

3.1. Data collection and sample selection

Data used in this study was extracted from the following databases NHS Digital England Data sets and NHS England Statistics. The dataset of the number of complaints by acute providers initially contained 151 hospitals in 2019 and 142 hospitals in 2020. First, we adjusted the data for the hospitals that merged during the two years, to ensure consistency over time in the list of hospitals. Next, we exclude any hospitals reporting a value of 0 in A&E attendance as this indicates the absence of an emergency department. We also excluded any hospital with missing data on any of the other variables. The final sample contains 100 observations for both years.

The NHS hospitals in the sample can be classified into two main categories: Foundation NHS Trust Hospitals and NHS Trust Hospitals. A distribution of the sample by year and hospital type is presented in Table 1 below. Table 2 presents a distribution of the sample by county in England and shows that the sample includes hospitals from all England counties.

Table 1. Distribution of the sample by year and hospital type

Hospital type	Number of hospitals in 2019	Number of hospitals in 2020
Foundation NHS Trust	63	63
NHS Trust	37	37
Total Observations	100	100

Table 2. Distribution of the sample by county in England

Commissioning Region	Number of hospitals in 2019 and in 2020
London	14
Midlands	19
Northeast Yorkshire	18
Southeast Yorkshire	9
Northwest	17
Southeast	14
Southwest	9
Total Observations	100

3.2. Variable measurement

Table 3 presents the definitions of the variables, together with the source and the frequency with which the data have been reported by each hospital.

Table 3. Variables definition and source

Variable	Variable Definition	Source	Data reporting frequency
WC	The number of written complaints filed either by or on behalf of a patient regarding services provided by NHS England. The number includes the complaints made against NHS Hospitals and Community Health Services.	NHS Digital	Monthly
PW for 13 Weeks + for D&P	The number of NHS patients in England waiting for more than 13 weeks for a diagnostic test or procedure at the end of each month. Diagnostic tests and procedures are defined as the tests or procedures used to determine a patient's condition or disease. The waiting time is measured from when a request for a diagnostic test or procedure is made to when the patient receives that test or procedure.	National Statistics	Monthly
Cancer PW 62D+ for 1st Treatment	The number of patients that have attended an outpatient appointment for suspected cancer within two months from meeting with their GP. According to NHS England standards, cancer patients must receive their first treatment within the first two months of their diagnosis.	NHS England and NHS Improvement	Monthly

A&E Attendances	Total number of monthly attendances to the Accidents & Emergency department, including Minor Injury Units and Walk-in Centres. It includes any patient waiting for over four hours for admission following the decision to admit.	NHS England	Monthly
Overnight bed occupancy rate	Average number of overnight occupied beds divided over the total number of overnight beds available.	NHS England	Quarterly
Reported safety incidents	Number of patient safety incidents reported to the National Reporting and Learning System (NRLS) in the last 12 months. The data is based on the date the incident report was submitted to the NRLS and not on the date of the incident.	National Reporting & Learning System (NRLS)	Monthly
Year	The dummy variable indicates if the data refers to 2019 (value 0) or to 2020 (value 1). 2019 refers to the period before COVID-19 and the year 2020 refers to the period during COVID-19	-	-
Foundation Status	The dummy variable with a value of 0 if the hospital is an NHS Trust type, and a value of 1 if the hospital is an NHS Foundation trust type.		
Covid-19 Cases	Average total number of Covid-19 cases reported by each hospital. The data have been reported monthly only in 2020.	NHS England	Monthly

3.3. Empirical strategy

In this study, linear regression will be used to determine which variables affect the number of written patients' complaints received by the hospitals for the years 2019 and 2020 and to analyse any changes before and during the pandemic. SPSS Statistical software will be used to carry out descriptive statistics, correlations analysis and regression analysis. The regression model will also be run separately for 2019 and for 2020 to allow a comparison of the results between the two years.

The formula for the linear regression is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Where:

Y is the number of patients written complaints (WC).

X₁ is the number of cancer patients waiting 62+ days for their first treatment.

X₂ is the number of patients waiting for 13weeks+ for diagnostic tests and procedures.

X₃ is the number of A&E attendances.

X₄ is the rate of overnight beds occupancy.

X₅ is the number of reported safety incidents.

For 2020, the model will also include the number of Covid-19 cases reported by each hospital as a control variable to control for the effects of the Covid-19 pandemic on the number of complaints.

The formula for the linear regression for the second model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Where:

Y is the number of patients written complaints (WC).

X₁ is the number of patients waiting for 13 weeks+ for diagnostic tests and procedures.

X₂ is the number of cancer patients waiting 62+ days for their first treatment.

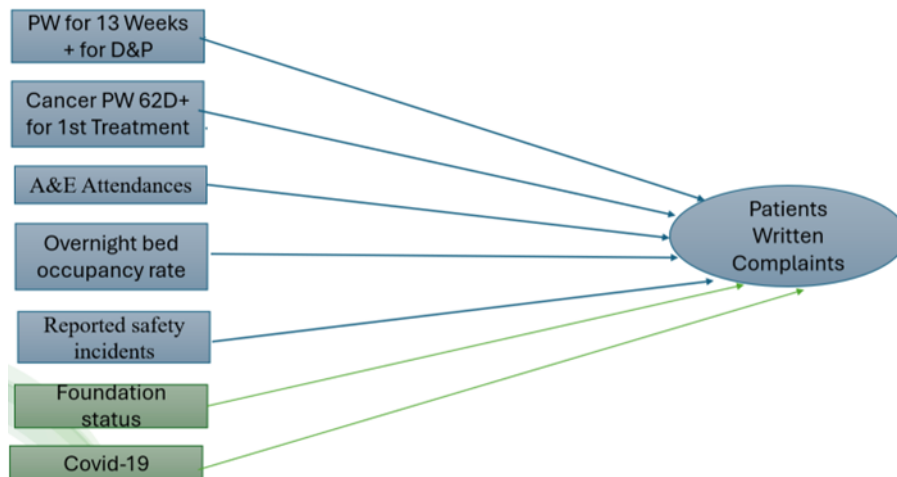
X₃ is the number of A&E attendances.

X₄ is the rate of overnight beds occupancy.

X₅ is the number of reported safety incidents.

X₆ is the number of reported Covid-19 cases.

Fig.1: Theoretical Framework



4. Results

4.1. Descriptive statistics

Table 4 summarizes the descriptive statistics of our final sample of 200 observations corresponding to 100 hospitals for 2019 and 2020.

Table 4. Descriptive Statistics

	N.	Min.	Max.	Mean	Std. Dev.	VIF
Written Complaints	200	25	2567	446.20	381.555	-
P W for 13 weeks+ for D&P	200	0	40581	6780.97	9334.360	2.972
Cancer P W 62D+ for 1st Treatment	200	7	773	177.25	130.856	1.572
A&E Attendances	200	5640	519353	153353.85	83476.171	2.008
Overnight bed occupancy rate	200	.22	.97	.7812	.12929	1.704

Reported safety incidents	200	534	41399	11019.03	6099.038	2.174
Year	200	.00	1.00	.5000	.50125	3.400
Foundation Status	200	.00	1.00	3.3700	.48402	1.081
Covid-19 Cases	200	0	66998	8708.92	12597.167	3.847

Descriptive statistics also show a high variability in key indicators (e.g., written complaints, A&E attendances, safety incidents, and Covid-19 cases) reflecting diverse hospital conditions and patient volumes. In terms of multicollinearity, the Variance Inflation Factor (VIF) values mostly below 4 indicate acceptable levels of multicollinearity for regression analysis, though variables like Covid-19 cases and Year need careful handling.

The highest VIF value belongs to the number of Covid-19 cases, which means that the impact of Covid-19 is evident with high mean and variability in cases, necessitating a focus on how the pandemic influenced other variables, for this reason in the next steps of the analysis we will separately consider this variable and run a model with the control variable and one without, this will help us assessing the robustness of the results.

Table 5. Descriptive Statistics 2019 and 2020

Mean	Mean 2019	Mean 2020	t	P-value
Written Complaints	78,612	32,838	0.18617	0.434741
P W for 13 weeks+ for D&P	57,634	1,482,070	0.55667	0.30829
Cancer P W 62D+ for 1st Treatment	20,896	20,807	0.07558	0.473317
A&E Attendances	20,576,119	15,459,404	-0.24583	0.408955
Overnight bed occupancy rate	0.76	0.59	0.17669	0.438012
Reported safety incidents	1,270,694	1,228,006	1.13099	0.160638

Descriptive statistics reveal a 56% decrease in the mean for written complaints in 2020 compared to 2019 (-0.186, $p < 0.01$) The A&E attendances (-0.24583, $p < 0.01$) also dropped by 20%. This decrease confirms the finding by Ghaffar and Garlapati (2020) since fewer people visited the emergency departments over fears of catching the virus. Additionally, the average bed occupancy rate (0.17669, $p < 0.01$) decreased by 16% from 2019 to 2020, the cancellations of all non-urgent procedures could explain that drop because of the pandemic. The average reported safety incidents (1.13099, $p < 0.01$) also showed a 7% drop, in 2020 compared to 2019. In contrast, the mean for cancer patients waiting for 62day+ for 1st treatment (0.075, $p < 0.01$) has slightly increased by 7%. Finally, the average reported safety incidents showed a 7% drop, in 2020 compared to 2019. The mean for the average number of patients waiting for 13weeks+ for routine diagnostics and procedures (0.55667, $p < 0.0$) has increased 28 times more than in 2019.

Table 6. Correlations table

	Number of Written Complain ts	P W for 13 week s+ for D&P	Cancer P W 62D+ for 1st Treatm ent	A&E Attendan ces	Overnig ht bed occupan cy rate	Numbe r of Report ed Safety Incide nts	Year (Dum my Variab le)	Foundati on Status (Dummy Variable)	Covi d Cas es
Number of Written Complain ts	1								
P W for 13 weeks+ for D&P	-.178*	1							
Cancer P W 62D+ for 1st Treatmen t	.477**	.314**	1						
A&E Attendan ces	.721**	0.107	.487**	1					
Overnigh t bed occupanc y rate	.454**	-.312**	.187**	.383**					
Number of Reported Safety Incidents	.392**	.389**	.534***	.583**	.168*	1			
Year (Dummy Variable)	-.464**	.677**	0.047	-.210*	-.566**	0.063	1		
Foundati on Status (Dummy Variable)	0.121	0.076	0.097	.205**	.154*	0.066	0.000	1	
Covid Cases	-.171*	.779**	.336**	.206**	-.297**	.477**	.693**	0.039	1

This table provides the pair-wise Pearson correlation coefficients for all the variables and for the full sample (2019 and 2020 data). ** and * indicate statistical significance at the 1% and 5% level, respectively.

The number of written complaints has a strong negative correlation with the number of patients waiting for 13 weeks+ for D&P (-0.178, $p < 0.1$) The negative correlation between patients waiting for 13 weeks+ for D&P and prolonged waiting times for diagnostics indicates potential operational efficiency issues within NHS hospitals and suggests a negative hypothesis, reject H_1 . Additionally, our variable also negatively correlates with the number of Covid-19 Cases (-0.171, $p < 0.1$), and year (-0.464, $p < 0.05$). This suggests that fewer complaints were presented to the hospitals during the Covid-19 year, possibly due to reduced patient interactions or other reporting dynamics. On the other hand, the number of written complaints is strongly positively correlated with A&E Attendances (0.721, $p < 0.05$), Cancer Patients Waiting for 62D+ for 1st Treatment (0.477, $p < 0.05$), Overnight Bed Occupancy Rate (0.454, $p < 0.05$), and Number of Reported Safety

Incidents (0.392, $p < 0.05$). Such results indicate that higher complaints are associated with higher patient volumes, longer waits, higher bed occupancy and more safety incidents.

4.2. Regression analysis

Table 6. Regression results

		2019 and 2020 Combined		2019 (Before Covid-19)		2020 (During Covid-19)	
Model		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	Unstandardized B.	-	33.33	-4.196	-26.994	58.978	48.610
		219.959*					
	Standard Error	(111.880)	(153.616)	(181.625)	(196.423)	(111.959)	(119.496)
P W for 13 weeks+ for D&P	<i>Standardized B.</i>	-	-	-	-	-	-
	Unstandardized B.	-	-0.001	0.010	0.010	0.001	0.001
		0.012***					
Cancer P W 62D+ for 1st Treatment	Standard Error	(0.002)	(0.003)	(0.027)	(0.027)	(0.002)	(0.002)
	<i>Standardized B.</i>	-0.303	-0.029	0.023	0.023	0.035	0.048
	Unstandardized B.	0.772***	0.795***	1.127***	1.127***	0.238*	0.260**
A&E Attendances	Standard Error	(0.156)	(0.145)	(0.247)	(0.248)	(0.127)	(0.128)
	<i>Standardized B.</i>	0.265	0.273	0.330	0.330	0.169	0.185
	Unstandardized B.	0.003***	0.003***	0.003***	0.003***	0.001***	0.001***
Overnight bed occupancy rate	Standard Error	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	<i>Standardized B.</i>	0.584	0.593	0.559	0.563	0.410	0.497
	Unstandardized B.	249.051*	-13.48	-105.404	-94.565	-104.654	-92.961
Reported safety incidents	Standard Error	(149.652)	(153.564)	(225.821)	(229.536)	(164.406)	(166.632)
	<i>Standardized B.</i>	0.084	-0.005	-0.031	-0.028	-0.044	-0.039
	Unstandardized B.	0.001	0.004	0.006	0.006	0.007**	0.008**
Year	Standard Error	(0.004)	(0.004)	(0.006)	(0.006)	(0.003)	(0.003)
	<i>Standardized B.</i>	0.014	0.068	0.072	0.071	0.268	0.301
	Unstandardized B.	-	-95.747*	-	-	-	-
Foundation Status	Standard Error	-	(55.948)	-	-	-	-
	<i>Standardized B.</i>		-0.126				
	Unstandardized B.	-	-12.835	-	18.171	-	-10.297
	Standard Error	-	(32.666)	-	(58.013)	-	(26.490)
	<i>Standardized B.</i>		-0.016		0.020		-0.027

Covid-19 Cases	Unstandardized B.	-	-0.009***	-	-	-	-0.002
	Standard Error	-	(-0.002)	-	-	-	(0.002)
	<i>Standardized B.</i>		<i>-0.308</i>				<i>-0.162</i>
R-Square		0.645	0.697	0.652	0.652	0.571	0.601
F statistics***		70.425	54.793	35.20819.79	29.075	27.375	19.796
				6			
N. Observations		200	200	100	100	100	100

This table provides the Regression estimation results of our models. The dependent variable is the number of written customer complaints. Standard errors are reported in parentheses under unstandardized B coefficients. Standardized Beta coefficients are reported in italics below. ***, ** and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Regression analysis was used to test if the determinants of quality-of-care that we identified from prior literature significantly impact the number of patient complaints. Three regression models were run: combined years (2019 and 2020), pre-Covid-19 (2019), and during Covid-19 (2020) to examine the impact of Covid-19 on the variables. The number of Covid-19 cases will help us establish to what extent the hospitals were pressured by the number of Covid-19 inpatients.

The first regression model explains 64.5% ($R^2 = 0.645$) of the variation in the number of written complaints, indicating a strong fit.

Contrary to hypothesis 1, for patients waiting for 13 weeks+ for D&P in the combined model, there is a significant negative relationship ($\beta = -0.012$, $p < 0.01$), indicating that longer waiting times for diagnostics and procedures decrease the number of written complaints received by the hospitals. This could imply that patients have more patience during extended waiting periods due to potential awareness of system strains, and hence they present less complaints. This result does not support H1. In model 2, controlling for the year and the number of Covid-19 cases, the relationship becomes insignificant, suggesting that the pandemic period may have altered patient expectations or complaints reporting behaviours. When we split the sample in before and during Covid-19 for a more in-depth analysis, the coefficient becomes positive, more in line with H1, but it is again not significant. Therefore, H1 remains not supported.

The number of cancer patients waiting 62 days + for 1st Treatment is consistently positive and significant across all models ($\beta = 1.127$, $p < 0.01$) and ($\beta = 0.772$, $p < 0.01$), indicating that delays in cancer treatment above 62 days increase the number of written complaints. This result strongly supports H2 and highlights a critical area for quality of care and patient complaints.

The number of A&E attendances also shows a significant positive relationship with the number of written complaints across all models ($\beta = 0.003$, $p < 0.01$), suggesting that higher A&E attendances correlate with more written complaints received by hospitals. This supports H3 and indicates that the increase in number of attendances to access and emergency services has increased patient complaints. The strength of this relationship is slightly reduced during Covid-19, but it remains significant.

The overnight bed occupancy rate is positive and significant only in the combined model ($\beta = 249.051$, $p < 0.1$). In line with hypothesis 4, higher occupancy rates increase the number of complaints, although this becomes insignificant when controlling for the year and the number of Covid-19 cases (model 2), indicating other factors might moderate this effect during Covid-19.

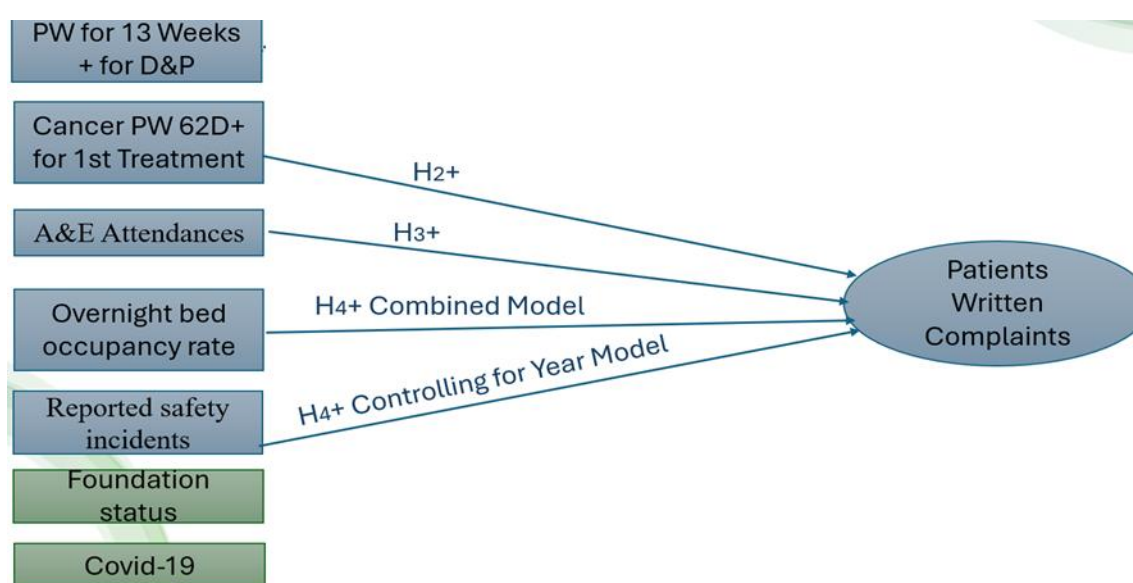
On the other hand, the number of reported safety incidents is not significant in the combined model, but it is positive and significant during Covid-19 ($\beta = 0.007$, $p < 0.05$ and $\beta = 0.008$, $p < 0.05$), in line with hypothesis 5. This suggests that during the Covid-19 pandemic there has been an increase in the number of reported safety incidents, which has significantly increased the number of written patient complaints that hospitals have received.

With regards to the control variables, not in line with the expectation, the foundation status of the hospital is not significant across all models, suggesting that being a foundation trust hospital does not significantly influence the number of complaints. The year dummy is negative and significant in the combined model ($\beta = -95.747$, $p < 0.10$), indicating that in general fewer complaints were received in 2019 vs. 2020. This evidence justifies analysing the data splitting the sample in the two periods: before Covid-19 and during Covid-19, to verify if there is any difference in the significant determinants between the two periods. The results for model

5 and 6 reveal that on top of cancer patients waiting 62 + days for the 1st treatment and A&E attendances, also the number of reported safety incidents is positively significantly related to the number of written complaints in the period during Covid-19 (year 2020).

Finally, contrary to the expectations, the number of Covid-19 cases reported by the hospitals shows a significant negative relationship with the number of written patients' complaints in the combined model ($\beta = -.009$, $p < 0.01$), indicating that NHS hospitals with a higher number of Covid-19 cases received less written complaints by patients. However, the analysis splitting the sample in the two periods (before Covid-19 and during Covid-19) shows that the number of Covid-19 cases is not significantly related to the number of complaints. This means that during Covid-19 having more Covid-19 cases to deal with did not negatively impact the quality of care received by patients, in terms of the number of complaints.

Fig 2 : Theoretical Framework with results



5. Discussion

The study explores the relationship between patient complaints and operational and safety factors, revealing several key findings. The findings of this study contribute to filling a gap in the literature by providing a more integrated understanding of the factors affecting healthcare quality. The study shows that two factors which are Cancer Patients Waiting 62 week+ for 1st Treatment and A&E attendances are significant, and positively influence patients' complaints. In addition, Overnight Bed Occupancy Rate and Reported Safety Incident are only significant in one model at least. Whereas Patient Waiting for 13 weeks+ for Diagnosis and Procedures is irrelevant. Therefore, only by examining at the same time multiple determinants, it is possible to identify which ones are significantly impacting the quality of care. It is not enough to study them individually. This research offers a broader perspective on the elements that may explain variations in the quality of care, which can help guide strategies to improve service delivery and patient satisfaction.

In examining the relationship between patient complaints and waiting times for routine diagnostics and procedures, our study diverges from prior research expectations. Previous studies,

such as those by Reader et al. (2014) and Gagliardi et al. (2021), anticipated a positive correlation between the number of patient complaints and extended waiting times. Reader et al. (2014) explored the relationship between patient dissatisfaction and waiting times, finding a positive correlation. However, the study did not focus on formal complaints; it only assessed general patient dissatisfaction. This distinction is crucial, as a patient may feel dissatisfied without necessarily filing a formal complaint. The dependent variables in these studies are different, which could explain the varying findings. Had Reader et al. (2014) examined patient complaints rather than dissatisfaction, they might not have identified a significant relationship between waiting times and complaints. Gagliardi et al. (2021) reviewed 51 studies examining the impact of prolonged waiting times on variables such as patient anxiety and worsening health outcomes, which differ from the variables used in our study. Another reason for the divergence in findings may also stem from the specificity of the sample population in Gagliardi et al.'s review, which focused on feedback from patients undergoing organ transplants, surgeries, and cancer management. In contrast, our study investigates the relationship between the number of patients waiting over 13 weeks for routine treatments or procedures and the total number of formal complaints received by the hospitals. Our results align with Chu et al. (2019) who found that the uncertainty associated with waiting times is a significant source of patient frustration, patients become more tolerant of delays when they are better informed. Our results show a remarkable reduction in complaints during the COVID-19 pandemic. Public awareness of the NHS's strain during the pandemic likely fostered a greater understanding and tolerance of delays, reflected in decreased complaint rates in 2020 compared to 2019.

Our study also highlights some critical insights regarding cancer patient wait times and A&E attendance. Consistent with previous findings by Mathews, Ryan, and Bulman (2015), Willis et al. (2015), and Hanna et al. (2020), we observed that longer wait times for cancer treatment (over 62 days) were associated with an increase in written complaints. This is in support of Hypothesis 2 of this study. Our study reinforces on the finding of Mathews, Ryan, and Bulman (2015), which was a qualitative interview-based study in which many cancer patients expressed dissatisfaction with the length of time they had to wait for treatment. Hanna et al. (2020) underscores the critical importance of timely cancer treatment to improve survival outcomes. Our results build on the findings of Hanna et al. (2020) as we found that there is a positive and significant relationship between cancer patients waiting more than 62 days for first treatment and patient complaints received by the hospitals.

Similarly, Hypothesis 3 was positive and significant across all models. This study agrees with previous studies such as and Ghaffar and Garlapati (2020), that the higher is the number of A&E Attendances, the higher is the number of written complaints the hospital receives. The results of our study consolidate the findings of Ghaffar and Garlapati (2020), in which they explored the relationship between patient complaints and emergency department (ED) attendances during the Covid-19 pandemic. The study found similar findings to ours highlighting a significant increase in the number of complaints related to delays in care and overcrowding in EDs during the pandemic. This increase in complaints was linked to the surge in ED attendance, which overwhelmed healthcare facilities. Improving resource allocation and communication with patients could help mitigate some of these issues during future healthcare crises. Our results also complement those found by Carter, Pouch and Larson (2014) systematic review highlighting that overcrowding in emergency departments impacts patient outcomes as it can lead to delays in treatment, reduced quality of care, and increased patient dissatisfaction.

Our findings on bed occupancy suggest the need for further investigation. Hypothesis 4 was positive and significant only in the combined model, indicating that in 2019 and 2020 higher overnight bed occupancy was associated with an increase in the number of written complaints received by hospitals. These results are consistent with previous literature, such as Keegan (2010) and Bosque-Mercader and Siciliani (2023). However, when controlling for specific years and Covid-19 cases, this association lost significance, contradicting earlier studies. This discrepancy suggests that previous studies might have found similar results to ours had they accounted for the year effect between 2019 and 2020.

Regarding the number of reported safety incidents, combining all the data in the regression model the variable is against our expectations but the year effect is significant when we run the model separating 2019 and 2020 data. The results are positive and significant and are consistent with prior research (Hickson et al., 2002). They show a positive correlation between reported safety incidents and the number of written complaints. This reinforces prior findings by Hickson et al. (2002), who found that complaints were often linked to safety incidents. Hickson et al. (2002) found that healthcare providers who were frequently the subject of patient complaints were also more likely to be involved in safety incidents. This suggests that patient complaints can be an important indicator of underlying safety and quality issues within healthcare settings. Since the number of reported safety incidents became significant in 2020 i.e. during covid-19, therefore, it could be argued that the covid-19 crisis gave more importance to the reported safety incidents. As a result hospitals should look into the NRSI because if tend to trigger complaints. As Gillespie and Reader (2016), we caution against relying solely on patient complaints to predict future safety incidents, because complaint data often lack the specificity needed to effectively identify underlying safety risks. That is the reason why we separated the sample between 2019 and 2020, and we also tested for the Covid-19 effect.

Despite its valuable findings, this study has several limitations that should be acknowledged. First, the analysis is restricted to NHS hospitals in England, limiting the generalizability of the results to other regions or healthcare systems with different operational structures. Second, the data relies on reported written complaints, which may not fully capture the spectrum of patient dissatisfaction, as some complaints may remain unreported or be resolved informally. Third, the study period covers only two years, 2019 and 2020, which may not fully capture long-term trends or changes in complaint patterns beyond the immediate effects of the Covid-19 pandemic. Additionally, the inclusion of Covid-19 cases as a control variable may not entirely account for the multifaceted impact of the pandemic on healthcare operations and patient perceptions. Finally, the use of linear regression, while effective for identifying relationships, does not account for potential nonlinear interactions between variables, which may influence the number of complaints in complex ways.

Future research could address expanding the data scope, exploring alternative methodologies, and examining patient complaints over a more extended period to better understand evolving trends in healthcare quality. Broadening the scope of data collection, including a wider range of hospitals (private and public) and patient demographics, would provide more comprehensive insights into the factors that influence patient dissatisfaction. This would allow for more accurate predictions of potential issues, helping healthcare systems like the NHS to anticipate and proactively manage complaints before they escalate. Additionally, expanding research methods by conducting case studies on specific hospitals would enable a deeper understanding of how healthcare systems respond to shocks, such as a sudden surge in demand or operational disruptions like those experienced during the Covid-19 pandemic. This targeted approach can reveal patterns in complaints management and resource

allocation, offering strategies to minimize patient dissatisfaction during crises. By refining data collection and research approaches, future studies could enhance the NHS's ability to improve service delivery, reduce complaints, and foster better patient outcomes.

6. Conclusion

This research offers an in-depth analysis of the factors affecting hospital performance within the NHS, focusing on patient complaints in 2019 and 2020. By considering a wider range of variables and using a linear regression model, the study provides fresh insights into how operational pressures and patient interactions contribute to formal complaints. The findings can guide strategies aimed at improving service delivery and patient satisfaction, filling a gap in the literature by providing a more integrated understanding of the factors shaping healthcare quality. As a result, this research presents a more holistic view of the elements that may explain variations in the quality-of-care patients receive.

This study provides important insights into the relationship between hospital operational metrics and the number of written patient complaints received by NHS hospitals in England during 2019 and 2020. Our findings reveal that longer waiting times for cancer treatments and higher A&E attendances are consistently associated with increased patient complaints, highlighting critical areas for improving patient care and communication. The study also shows that the Covid-19 pandemic had a significant influence, with fewer complaints in 2020 than in 2019, likely due to heightened public awareness and tolerance of NHS pressures during the pandemic. Additionally, it also found that the impact of bed occupancy and safety incidents on complaints changed with the year considered (2019 vs. 2020), emphasizing the complex nature of patient dissatisfaction during a healthcare crisis. Controlling for the year BOR is not significant when we split the sample for years and number of reported safety incidents became significant when dividing the sample between 2019 and 2020, which made number of reported safety incidents significant during covid-19, which leads to the argument that the covid-19 crisis shed more light on the number of reported safety incidents. These results underline the importance of continuous monitoring and addressing of factors contributing to patient dissatisfaction, particularly in times of increased strain on healthcare systems. Improving resource allocation, enhancing patient communication, and managing patient expectations could help mitigate the impact of these variables on patient complaints in the future.

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