

NHS review of winter 2017/18: annex

September 2018

We support providers to give patients safe, high quality, compassionate care within local health systems that are financially sustainable.

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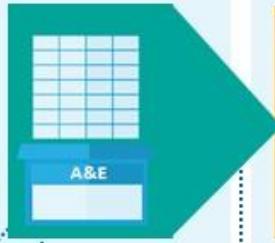
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What drives A&E performance

<h3>The problem</h3> <p>Many trusts did not meet the A&E four-hour maximum waiting time standard in winter 2017/18. To help improve next winter, we wanted to understand what was behind this.</p>	<h3>Our analysis</h3> <p>We have undertaken detailed analysis of what drives A&E performance using daily data from winters 2016/17-17/18. We have used econometric analysis which allows us bring together all the factors and isolate the effect of each on A&E performance. We grouped the factors into the A&E department and patient flow.</p>
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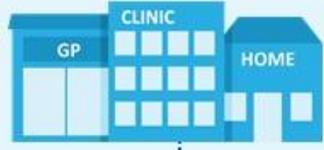
The A&E department

The capacity of A&E departments to respond to higher numbers of patients in winter affects performance.



Patient flow

Maintaining good patient flow ensures hospitals have capacity to admit new patients from the emergency department, avoiding bottlenecks.



Key factors

Workforce

Senior doctors make quicker decisions so patients wait for less time

Resilience to pressures

How well providers respond to and recover from pressure affects performance

Admissions

High daily and uneven hourly admissions decrease performance

Bed occupancy

Rising occupancy reduces performance, with accelerating effects above 92%

Flu

1/3rd of the growth in emergency admissions came from flu in winter 17/18

Long-stay patients

Long-stay patients can decrease performance by reducing bed flexibility

Discharges

Discharges on the day and previous days improve performance

Introduction

The delivery of urgent and emergency care is highly complex, influenced by a range of factors that can be volatile and interconnected, especially during high pressure periods. The specific effects of each factor may not always be clear when looking at headline metrics. To overcome this, we have applied econometric analysis to isolate and identify those factors that had the most effect on winter accident and emergency (A&E) performance in England in 2016/17 and 2017/18. We've set out these findings, and the approach we used, in this report. This helps us understand which actions will be most effective in improving A&E performance in future.

We focus on understanding the drivers of performance at type 1 A&E departments¹ as they account for most breaches of the four-hour standard. Type 1 A&E departments have constant interaction with other hospital departments (eg to request diagnostic tests or admit patients) and the wider social and community care system (eg through A&E attendances). This means their performance is influenced by factors both inside and outside the A&E department. We have therefore focused our analysis on how patients flow through the entire emergency care pathway.

The complex nature of the emergency care system, combined with the large range of often volatile data available to observe it, makes it extremely difficult to determine what is driving performance. There are large differences in A&E performance between providers, driven substantially by often quite static, local factors that are difficult to quantify (eg culture or leadership) – which makes analysis of aggregated, sector level data misleading. The econometric approach we have used ensures these complexities are properly considered.

This work builds on the existing literature, including our 2015 report *A&E delays: why did patients wait longer last winter?*² which established the importance of admissions and bed occupancy in influencing A&E performance. The King's Fund analysed hospital capacity in more detail (*NHS hospital bed numbers: past, present, future*³), and focused on increasing bed shortages. Our analysis adds to

¹ Consultant-led, 24/7 A&E departments with full resuscitation facilities.

² <https://www.gov.uk/government/publications/ae-delays-why-did-patients-wait-longer-last-winter>

³ <https://www.kingsfund.org.uk/publications/nhs-hospital-bed-numbers>

this evidence base by looking at daily bed occupancy, in particular to identify tipping points past which A&E performance deteriorates rapidly, and the types of patients in the beds, especially long-stay patients.

Findings

Each factor which influenced A&E performance is outlined below, grouped into two key parts of the emergency care pathway: patient flow and the A&E department.

Patient flow

Maintaining good patient flow right through the emergency pathway ensures hospitals have capacity to admit new patients, avoiding bottlenecks in the A&E department that are often the cause of long patient waits. Flow and A&E performance can be disrupted by high bed occupancy, long-stay patients and low discharges.

Bed occupancy

When bed occupancy is high, A&E departments can spend a lot of time looking for available beds for patients who need to be admitted. These patients then wait longer in A&E and are more likely to breach the four-hour target.

Bed occupancy is strongly associated with A&E performance across both winters.⁴ We find a tipping point above 92% bed occupancy, using daily Sitrep figures, where the effect on A&E performance accelerates. Some trusts can operate well with high bed occupancy while maintaining good performance, by compensating with the other factors we've identified below (eg higher resilience, more senior workforce) or others we have not analysed (eg by narrowing the gap between beds becoming available and being filled).

Our analysis finds a significant A&E performance tipping point at 92% bed occupancy. A study in 1999 found that beyond a daily bed occupancy level of 85%, lack of bed availability starts causing problems – in terms of quality and operational performance. This study used a simulation analysis, calibrated on data from two hospitals in England.

⁴ Bed occupancy was included in the analysis as discrete intervals to allow us to identify tipping points. We use general and acute beds only.

Long-stay patients

Hospitals with more long-stay patients – those who have been in hospital for 21 days or more – have additional bed pressures. Long-stay patients have two effects: on bed occupancy and bed flexibility. The effect on bed occupancy is already captured in the results reported in the section above. Long-stay patients affect bed flexibility by reducing the proportion of beds that providers can quickly free up to urgently accommodate new patients who need admitting for treatment.

We know that length of stay is influenced by case-mix and population demographic differences, so some providers will justifiably have more patients who stay for longer. To account for this, we focused on the proportion of stranded patients (seven days in hospital) who are long-stay patients. Long-stay patients may have a particularly large effect because they account for a disproportionately large amount of bed capacity – despite making up just 4% of patients they account for around 40% of total bed days.⁵

Our analysis finds a 10-percentage point increase in the proportion of stranded patients who are long-stay patients is associated with a 2 to 3 percentage points decline in A&E performance. This effect assumes bed occupancy remains steady.

While we identified a strong relationship with long-stay patients, our model did not find a significant link for delayed transfers of care (DTOCs) or stranded patients. Given that DTOCs and stranded patients mainly affect performance through bed availability and flexibility, it is likely that the bed occupancy and long-stay patient metrics will have captured most of this effect.

Nearly 350,000 patients spend more than three weeks in an acute hospital each year. This year, we are asking trusts to reduce the number of long-stay patients (and long-stay bed days) in acute hospitals by 25%. In doing so, we aim to free up 4,000 beds in acute trusts.

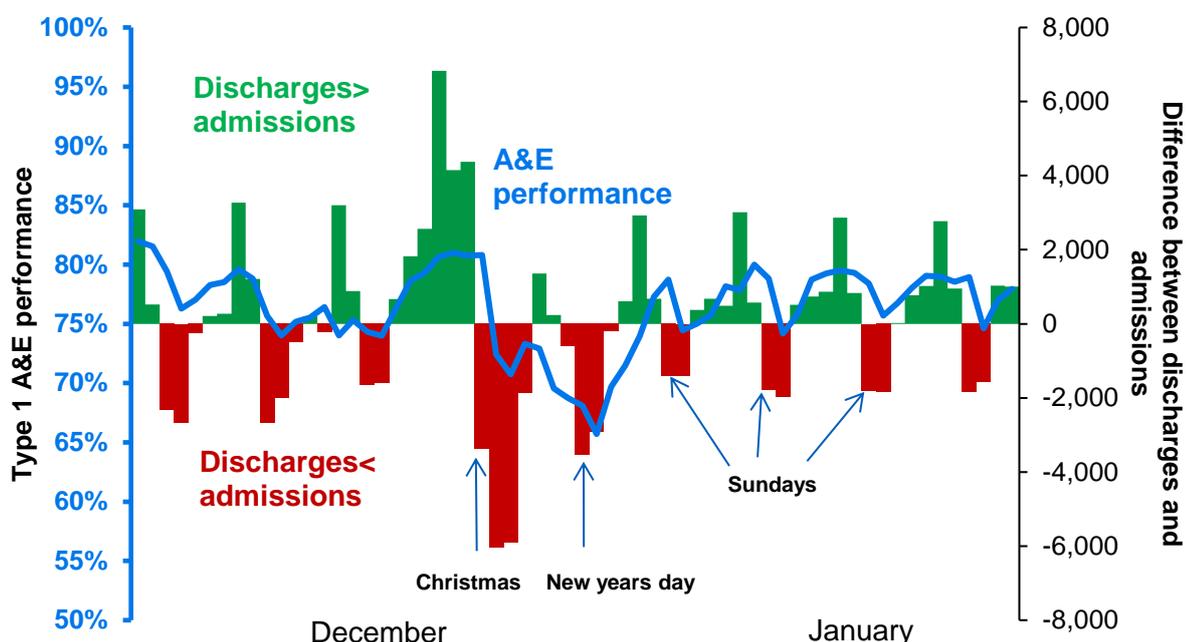
Discharges

Discharges play a key role in maintaining patient flow. We find that lower levels of discharges (relative to the number of non-elective admissions) leads to poorer A&E performance (see Figure 2). This not only affects A&E performance on the same

⁵ HES data FY 2016/17. Patients admitted to an acute trust, excluding mental health specialties and patients with a length of stay more than 365 days.

day, but also in the two subsequent days – the effect of pressure, the difference between admissions and discharges, accumulates over time. If a hospital has a 10% pressure increase on Saturday and Sunday, when Monday arrives it is already under strain of having extra patients in beds, which means its performance would on average be between 0.7% to 0.8% points worse. If it is not able to increase discharges on the Monday and has another 10% pressure increase, this would reduce performance by a further 0.4% points.

Figure 1: National winter 2017/18 pressure in the system⁶

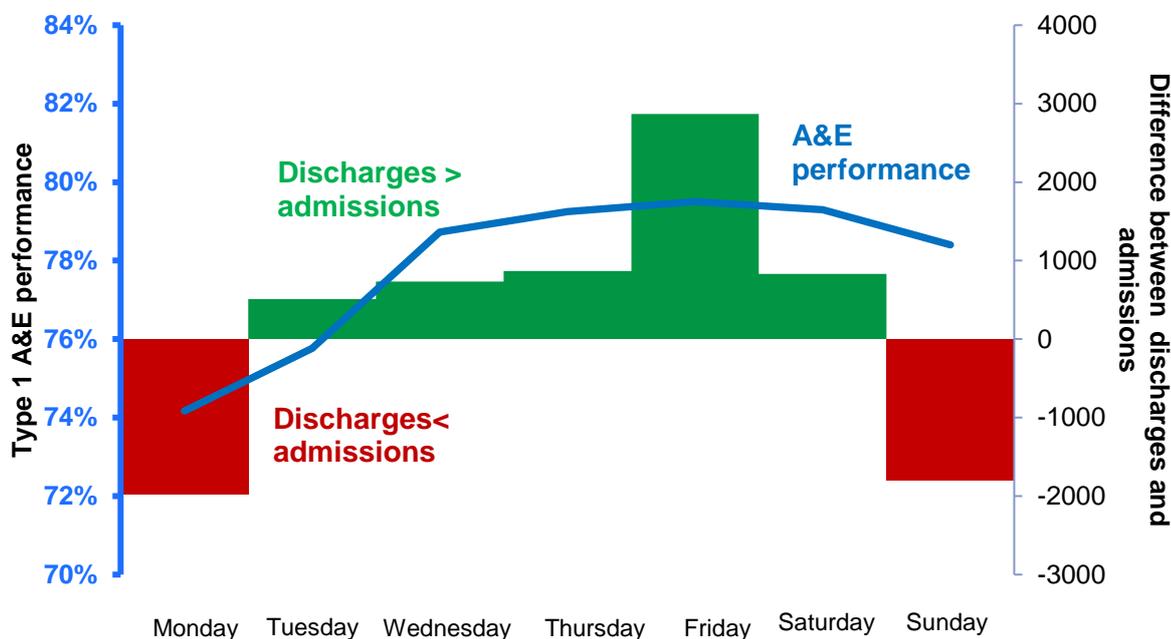


Source: Hospital Episode Statistics (HES) data

Figure 1 shows how the differences between discharges and admissions build pressure over time during winter 2017/18, which is strongly related to A&E performance. Pressure decreased in the run up to Christmas then experienced the largest increase following Christmas. For the rest of winter, there is a clear weekly pattern of pressure increasing on Sunday and Monday then reducing from Wednesday to Friday.

⁶ This chart only covers December and January because there is a delay before we can access HES data.

Figure 2: National winter 2017/18 pressure in the system – one week in mid-January



Source: HES data

This variation in discharges helps to explain the differences in A&E performance on each day of the week. For example, lower weekend discharges reduce the available bed base for the hospital’s busiest days (Monday and Tuesday) contributing to poorer performance on these days. Figure 2 illustrates this pattern for a typical week in mid-January.

We are planning to reduce the variation between weekday and weekend non-elective discharge volumes from acute hospitals. Crucially, this will be supported by ensuring staff in hospitals have timely access to social care assessment staff and social care practitioners seven days a week, and that multidisciplinary teams work together to make referrals and support discharge seven days a week.

Admissions variation

Demand is the inflow into the emergency care pathway. Our previous research showed that admissions affect A&E performance more than attendances,⁷ although high numbers of attendances do affect safety and staff workload. More admissions

⁷ *A&E delays: why did patients wait longer last winter?*
<https://www.gov.uk/government/publications/ae-delays-why-did-patients-wait-longer-last-winter>

stretch the capacity in the A&E department and in other hospital departments that need to find beds to admit patients to. We have extended this evidence by looking at two admission-based measures for demand in our model: daily admissions variation from the 90-day winter average, and hourly admissions variation. These account for both how many admissions there were in a day, and how spread out those admissions were during that day.

In line with previous work on A&E performance, we find higher than average daily admissions have an adverse effect on A&E performance. A 10-percentage point increase in admissions was associated with between a 0.2 to 1 percentage point decrease in A&E performance.

Hourly admissions variation can be hard for hospitals to accommodate if they do not have spare capacity. A smoother stream of admissions can give hospitals more time to free up beds by discharging patients gradually through the day. Providers with the highest hourly variation in emergency admissions had on average 3% points worse A&E performance than the lowest variation providers.

Patients under 10, over 60, and those referred by GPs have higher hourly admissions variation than other patient groups. This is driven by a greater number of admissions from these groups in the evening.

Flu

High rates of flu add to demand pressures, worsen patient flow and can spread infection to staff. In winter 2017/18, flu-related non-elective hospital admissions were over three times higher than the three previous winters⁸. This accounted for about a third of the emergency admissions growth between winter 2016/17 and 2017/18. Patient flow is affected because patients with flu generally stay for longer and are isolated to minimise contagion, which reduces the flexibility of beds.

It is difficult to quantify the precise effect of flu on A&E performance. We have identified flu patients as those with flu as their primary or secondary diagnosis in Hospital Episode Statistics (HES) data. Recording of diagnoses in HES can be variable, but our initial analysis suggests that a one percentage point increase in the proportion of general and acute beds occupied by flu patients decreased A&E

⁸ Data from Hospital Episode Statistics (HES). Patients with flu are identified as those whose primary or secondary diagnosis code is J09-J12.

performance by between 1.0% and 1.2%. This effect assumes bed occupancy and emergency admissions remain stable. Although this is a large effect, only five percentage of days in any trust across the winter exceeded 1.8% beds occupied by patients with flu, so a one percentage point increase represents a large change in flu cases.

A&E department

What happens in the A&E department itself is also crucial for A&E performance. A&E departments need to run efficiently to manage the increased volume of patient flow in winter, and the degree to which they are able to respond affects performance. Our model identifies two particular factors which determine how well A&E departments perform:

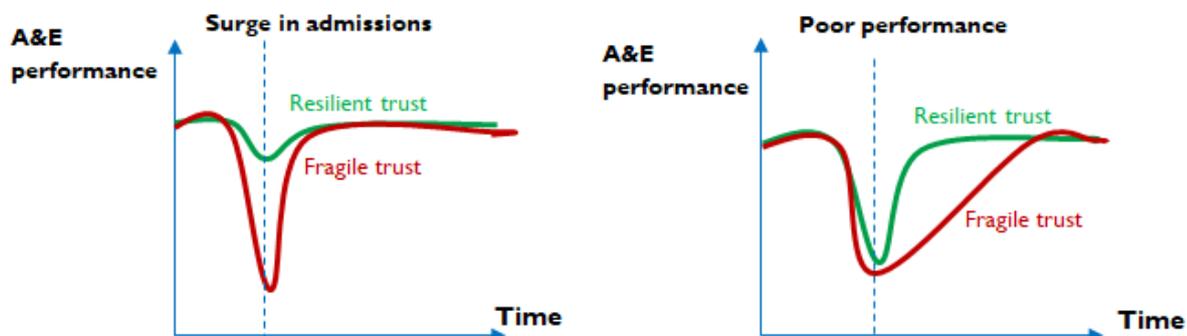
- resilience, driven by medium-term, institutional capacity (leadership, culture, operational processes), which we identify by how well providers respond to surges and deteriorating conditions over the whole winter period
- the type of workforce they have available, which can determine how quickly patients can be seen, treated and admitted or discharged.

Resilience

Measuring resilience helps us identify the differences in performance between providers, which are often driven by static, local factors that are difficult to quantify. We define resilience in two ways.

First, how much an A&E departments' performance falls after a surge in admissions (Figure 3, chart left). We split the 137 providers into five categories based on their resilience, with the most resilient providers experiencing half the dip in A&E performance than the least resilient. This resilience factor does not appear to be related to the other operational factors – more resilient providers do not seem to have lower bed occupancy or more senior workforce for example. This could therefore be picking up factors that we cannot measure, such as managerial capacity, culture or leadership.

Figure 3: Provider resilience from a surge in admissions and bounce back from poor performance



The second resilience factor measures how many days it takes a provider to bounce back from poor A&E performance (Figure 3, chart right). The most resilient providers were able to bounce back from dips in A&E performance by the next day. The least resilient providers took up to three days to recover. Comparing resilient providers with less resilient providers suggests that the ability to bounce back is driven by better operational capacity – eg lower bed occupancy and fewer long-stay patients.

Workforce

We find a 1 percentage point increase in the proportion of A&E staff who are senior doctors⁹ increased A&E performance by 0.1 to 0.2 percentage point. These senior staff are often responsible for making rapid treatment decisions, drawing on their large amount of experience, which improves patient flow.

Our analysis may well be underestimating the effect of workforce on A&E performance. We are limited to monthly workforce data for substantive staff only, from electronic staffing records (ESR) data. This means that we cannot observe how much daily or shift-level fluctuation in staff resources affects performance, or what effect staff vacancies or temporary staff may have.

⁹ Senior doctors are defined as registrars and above.

Method

We have brought together data, covering 137 providers (with a type 1 A&E department) between 1 December and 28 February in both 2016/17 and 2017/18. Then, by applying econometric analysis, we have been able to look at the effects of a large number of factors at the same time and determine which are statistically significant and most influential on performance. We have controlled for quality, size of A&E department and patient characteristics; all our findings above are in addition to the effect of these.

The econometric technique we use is a pooled ordinary least squares (OLS) model. This allows us to identify general characteristics of A&E performance, applicable across all the providers in the sample, to inform national policy and support. We tested the robustness of our approach by comparing it to other techniques – panel fixed effects and fractional response models – and found they yielded very similar results. This suggests that our findings are robust across a range of specifications and assumptions.

Our model was estimated using 2016/17 winter data, and then applied to data from winter 2017/18. We found the results to be very similar across both winters, adding confidence in our approach and findings. This suggests that the factors we identify are reasonably stable over time and will hold for next winter too – allowing us to better direct our support to providers.

NHS Improvement
Wellington House
133-155 Waterloo Road
London
SE1 8UG

0300 123 2257
enquiries@improvement.nhs.uk
improvement.nhs.uk

Follow us on  @NHSImprovement

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