Case Study on how

facilitated to improve the overall performance of

East & North Hertfordshire NHS Trust

while enhancing staff & patient experience using new methodologies

through AI & BI solutions

EAST & NORTH HERTFORDSHIRE NHS TRUST (ENHT):

- Has 600-bed district general hospital with a full range of specialties and hospital services
- Has both general and specialist services including critical care intensive, high dependency, coronary, pathology, radiology, and diagnostics services

BACKGROUND

The ENHT trust's main hospital facility, Lister Hospital was often facing ;

Extended wait times in ED with staff frustrated at only being able to react to volume surges that put extra strain on the providers and staff

A daily struggle to find beds for incoming patients with the bed management team firefighting on an hourly basis to accommodate the relentless demand from the emergency department and procedural areas

No clear picture on expected demand, capacity, and current utilisation to take a coordinated and unified action by the hospital's emergency department, bed management, inpatient and support departments such as housekeeping

Significant delays in patients receiving care in the emergency department

A lack of flow in the hospital between the demand coming into the hospital and capacity being created by the discharge flow

Patients frequently breaching the 4-hour target

All these problems were magnified exponentially with the COVID 19 pandemic and the hospital needed a way to prioritise patients for discharge and move them out in a proactive manner to continuously create capacity in the required amounts to match the demand from the emergency departments and other areas.

As there were severe financial constraints, a **high impact low-cost solution** that provided reliable and accurate data to make critical day-to-day operational planning decisions was required.

WHY SACH ANALYTICS?

Sach Analytics is a data science technology company in the healthcare industry. Through **Business Intelligence (BI), Data Analytics, Machine Learning (ML) and Artificial Intelligence (AI)**, Sach Analytics uses a combination of organisational and publicly available data sources to create predictive platforms that provide accurate and reliable data models.

These models can be used to **create early warning systems**, as well as **identify bottlenecks** and **make constant improvements** in operational processes. This leads to many benefits such as;

| Optimised operations | Cost reduction | Improved performance | Effective utilisation of staff, resources and inventory |

The **holistic technology solution** designed **using lean principles** which were targeted at root drivers of the problem around patient flow and extended LOS and the deep understanding of the healthcare industry that our expert data scientists, qualified healthcare professionals and industry experts at Sach Analytics gave ENHT confidence.

Our team's demonstrated high technical acumen combined with machine learning / AI, business intelligence, lean process improvement and specific proven results in hospital operations and the flexible approach and the ability to create turnkey solutions to meet exact demands while being a **cost effective solution** made choosing Sach Analytics an easy choice for ENHT.

THE 7 STEPS APPROACH WE FOLLOWED

01

Analysis of the problem

02

Creation of a pull mechanism through patient journey

03

Identification of levers that can be pulled to create capacity

04

Designing of specific AI models

Based on discussions with the trust leadership, key stakeholders and analysing data related to patient flow process, capacity and bed management

Sach Analytics determined the need to use a lean process improvement framework and by using the lean methodology, the key bottlenecks of the organisation causing the greatest impact to lack of flow and extended patient LOS were determined
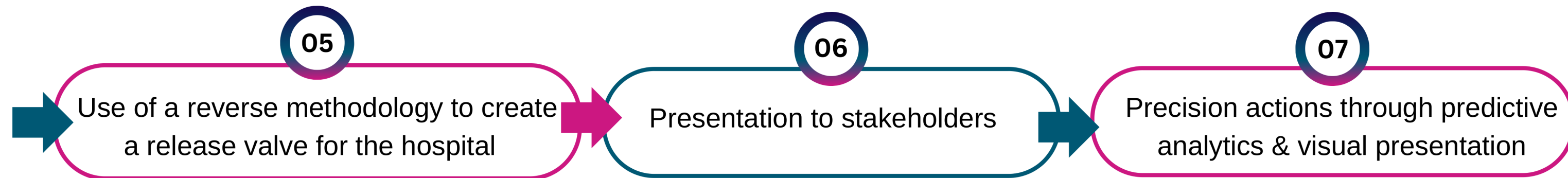
- Entry into the emergency department
- Admission of patients from the ED to assessment units
- Admission of patients from the ED to inpatient units
- Discharge of patients from inpatient units to home or long-term care facility

AI models based on process analysis and identification of root causes that prevent efficient flow in the hospital from the emergency department to patients being discharged from inpatient units

THE 7 STEPS APPROACH WE FOLLOWED CONTINUED..

05 — Use of a reverse methodology to create a release valve for the hospital

06 — Presentation to stakeholders

07 — Precision actions through predictive analytics & visual presentation

This was designed by first focusing on the end of the patient journey, the discharge from inpatient units and then working backwards to provide an immediate impact to operations.
The AI models were designed and created to:
- Predict new patient volume to the ED by hour of day for a rolling 14 days
- Predict the total demand for inpatient beds by hour for a rolling 14 days
- Predict the total number of patient discharges by hour for a rolling 14 days
- Predict patient level length of stay for inpatients at the time of admission
- Predict and identify breaches in ED and stranded patients in in-patient units before they occurred

The AI models were presented to key stakeholders such as operational and clinical managers in ED, bed managers, inpatient managers, clinical support functions on role specific visual dashboards that highlight:
- Demand vs capacity mismatch by inpatient unit before it occurs
- The future state of the entire hospital in bed demand and capacity by hour
- Required prioritisation of patients based on expected wait time in ED and LOS in in-patient units that need to be and are ready to be discharged

Some key decisions that were taken as one cohesive unit (ED, bed management, inpatient, clinical support functions) driven by predictive information include:
- Proactive staff resource allocation per department per hour
- Priority discharge patient list facilitation to ensure remaining clinical work, documentation and education are completed
- Proactive completion of care plans for prioritised patients
- Notification to community of patients requiring post hospital care and identification of facilities for intake
- Pre-emptive allocation of housekeeping staff for in-patient room turnover
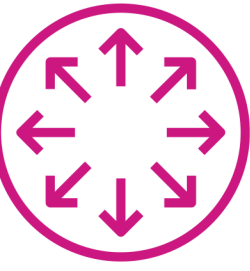
RESULTS

After implementation of the Sach Analytics AI models at ENHT;

ED performance improved

Through ED specific AI models (including new attendance prediction by hour, patient specific wait time predictions and patient specific inpatient admission / discharge home prediction), **ED performance was maintained consistently** with an **increase in average attendance by 15%.**

This achievement was made using the existing resources within the ENHT ED combined with future intelligence and proactive collaboration with in-patient units and community services. Furthermore, this level of ED performance was maintained during the latter end of the 1st and full 2nd waves of the COVID-19 pandemic that created highly volatile step changes in ED attendance.

Amidst the dynamic time period of Covid-19 where no historical patterns were followed, our AI model accuracy remained consistently above 90% with some days achieving 99% accuracy.

Inpatient bed capacity increased (both elective & non elective)

The discharge process was streamlined using our AI modules that predict patient specific LOS at the time of admission combined with total number of patient discharges predicted for a rolling 14 days.

The estimated discharge date accuracy increased up to 80% from the clinician-led estimated discharge accuracy rate of 66% with the implementation of the LOS prediction model.

For the **first time** in ENHT, the exact required **bed capacity for the next 14 days was identified** and created using patient specific future intelligence and action taken by the inpatient and bed management team. Furthermore, **a multidisciplinary advisory board** inclusive of members from operational, nursing, clinical, workforce, transformation and BI divisions was formed to drive how this predicted information is used in decision making to proactively manage bed requirements and improve patient flow within the hospital system.

Labour utilisation in clinical and non-clinical departments was optimised

Achieving precision staffing that allows an almost exact match to real patient demand is considered unachievable. However, using the Sach Analytics volume predictions has allowed;

ED, inpatient and housekeeping leadership to adjust and deploy resources exactly as needed with volume predictions performing on average above 90% accuracy.

Based on these early wins, the **Sach Analytics AI models are being continuously integrated into the operational planning and tactical decision-making process** with both clinical and non-clinical stakeholders fully engaged into the process. ENHT believes that once fully implemented to all departments, **significant additional impact** can be made.

THE FUTURE RELATIONSHIP

The relationship between ENHT and Sach Analytics is ongoing and further insightful models in new areas are being developed (e.g. readmissions). In addition to this ENHT is currently talking to ICS about adopting these models across the entire acute sector and beyond. This will lead to greater collaboration and improved economies of scale across the system.

> This ambitious project has greatly helped to ease the pressure on our emergency department and has been a real game changer for us. The AI models developed by Sach Analytics have been well received by both our operational and clinical leadership and is becoming a strategic driver within our entire ICS to manage demand pressures, patient flow, and better serve our patients.

Des Lane
Associate Director of Informatics & Performance Reporting
East & North Hertfordshire NHS Trust

SOME OF THE SAMPLE DASHBOARDS CREATED FOR ENHT

ED High Level Dashboards: Predicted ED hourly attendance & hourly inpatient demand
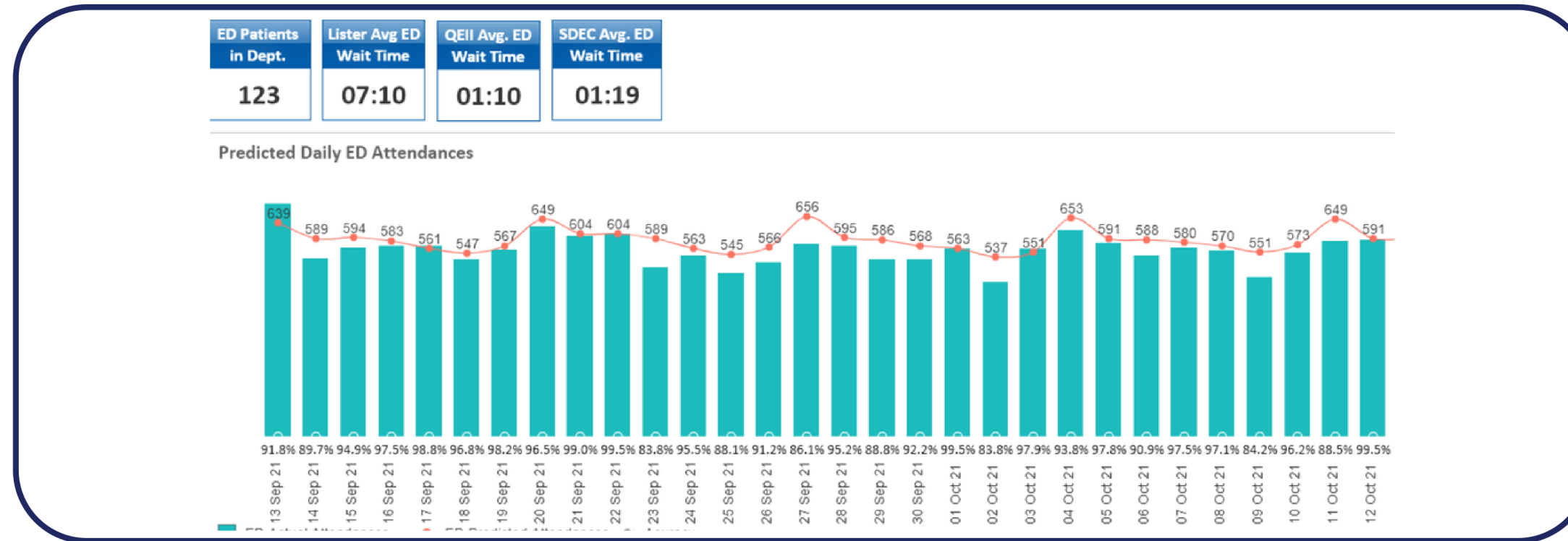
SOME OF THE SAMPLE DASHBOARDS CREATED FOR ENHT

Bed Modelling Dashboard: Predicted in-patient demand, predicted in-patient discharges with bed availability for 7 rolling days

Predicted bed availability for next 7 days (Excluding daycase and Mt Vernon beds)

* Bed Capacity (inc escalation) : 568

	Wed 2021-11-03	Thu 2021-11-04	Fri 2021-11-05	Sat 2021-11-06	Sun 2021-11-07	Mon 2021-11-08	Tue 2021-11-09
Required Discharges (Target)	135	142	147	99	84	135	154
Empty Beds	-3	3	10	12	11	-17	-20
Avail. Bed Base (Click to view beds)	559*	559*	559*	559*	559*	559*	559*
Inpatients	562	556	549	547	548	576	579
Predicted Non Elective Demand	158	154	161	137	136	161	164
Predicted Assmt. to IP Ward Demand	17	20	20	18	19	17	19
Actual EL Inpatient Adms (Exl DC)	18	19	7	0	0	17	17
Predicted Non Elective Discharges	109	116	125	85	74	104	112
Predicted Elective Discharges	23	26	22	14	10	14	22

If you are interested to hear more or would like to see a demo of the solution,

please reach out to Darsha on darsha.hewapanna@sachanalytics.com

or visit our website via www.sachanalytics.com

THANK YOU!