

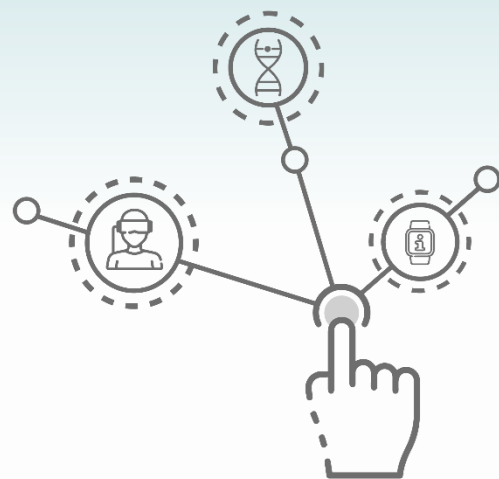


Delivering value with digital technologies
Briefing: June 2022



Using predictive analytics to improve mental health services

Case study



Supported by



Health Education England

Delivering value with digital technologies

Digital technologies such as digital medicine, genomics, artificial intelligence and robotics have a huge potential to transform the delivery of healthcare.¹

These technologies can empower patients to participate actively in their care, with a greater focus on wellbeing and prevention. They also support the prediction of individual disease risk and personalise the management of long-term conditions.

The HFMA, supported by Health Education England, is delivering a 12-month programme of work to increase awareness amongst NHS finance staff about digital healthcare technologies, and enable finance to take an active role in supporting the use of digital technology to transform services and drive value and efficiency.²

As part of the programme, the HFMA is publishing a series of case studies. Working with organisations who have started on the digital transformation journey, we will identify examples of good practice and highlight the challenges that services face. This will include specific challenges relating to NHS finance.

This case study describes how Mersey Care NHS Foundation Trust uses a predictive analytics tool to improve the care provided to people with mental health problems. Harnessing the power of the clinical data held within the electronic health records, the tool identifies those service users at risk of crisis in the next 28 days. This allows community mental health teams to ensure that adequate time and resource is allocated to those service users who need it most.

¹ HFMA *Introduction to digital healthcare technologies*, July 2021

² HFMA *Delivering value with digital technologies*

Introduction

Community mental health teams (CMHTs) provide multi-disciplinary assessment, treatment and care of people with severe and enduring mental health problems living in the community.

Mersey Care NHS Foundation Trust provides physical health and mental health services in the North West of England. Services are delivered by over 11,000 staff across more than 150 sites. The trust has nearly 1,000 inpatient beds, but over 90% of all contacts are in the community.

In common with many other mental health trusts, Mersey Care's CMHTs were experiencing rising caseloads and increasing numbers of service users with complex mental health problems. This meant that the service was prioritising the management of risk to keep people safe, and had limited time to deliver recovery-based care.

The lack of information about the size and complexity of team and practitioner caseloads meant that it was hard for managers to ensure that adequate time and resource was allocated to those service users who needed it most.

What is recovery-based care?

Recovery within the NHS mental health system is often referred to as the 'recovery model.' This model highlights the importance of building the resilience of people with mental health problems. As well as the importance of family and professionals supporting people's identity and self-esteem, people often see recovery in terms of clinical recovery, and personal recovery. There is often an overlap between them.³

Using digital technology to improve CMHT caseload management

The trust was keen to make better use of the information held in their clinical systems to address the issues outlined above. Using Global Digital Exemplar funding, the trust worked in collaboration with Holmusk to develop a digital solution, called the Management and Supervision Tool (MaST).

The tool uses a 'risk of crises' algorithm to identify those people who are most likely to require crisis services such as A&E, community mental health crisis services or inpatient care. It can also be used to identify people who are at the lowest risk of using crisis services, who can be reviewed and potentially discharged from the CMHT, with support from other services for their continued recovery. This has the potential to reduce the size of CMHT caseloads, freeing up time to care for others.

What's a mental health crisis?⁴

A mental health crisis is when a person feels at breaking point, and need urgent help. They might be:

- feeling extremely anxious and having panic attacks or flashbacks
- feeling suicidal, or self-harming
- having an episode of hypomania or mania, (feeling very high) or psychosis (maybe hearing voices, or feeling very paranoid)

Using predictive analytics to identify service users at risk of crisis

The MaST algorithm was developed using a dual approach of evidence-based and statistical analyses. It has been validated using electronic health record data sets from seven different mental health trusts.

³ Rethink Mental Illness factsheet

⁴ MIND

What is predictive analytics?

Predictive analytics is a branch of advanced analytics that makes predictions about future outcomes using historical data combined with statistical modelling, data mining techniques⁵ and machine learning⁶. To gain insights from large volumes of data, data scientists use predictive analytics to find patterns and make predictions about future events.

MaST determines the likelihood of any given service user using mental health crisis services within the following 28 days. The 'risk of crisis' algorithm uses the trust's health record data to assess the level of risk and complexity of any individual on the caseload, based on information recorded about a service user up to that point, including:

- contacts
- hospital admissions
- care cluster
- Health of the Nation Outcome Scales (HoNOS) records
- changes in accommodation status
- changes in employment status
- MHA section
- clinical risk assessment.

Providing business intelligence to managers and front-line staff

MaST is intended to be used by frontline staff, including doctors, mental health nurses and team managers. It shows them clinically relevant information that has been captured but is often buried deep within the electronic health record and uses predictive analytics to provide an analysis of team caseloads including:

- assessment of the risk of crisis and complexity measures for clinical prioritisation
- support to make decisions on resource allocation
- visualisation of patient flow
- reporting on safety and quality indicators
- weighting of caseloads.

The business intelligence team also use MaST to extract key performance information.

The following figures illustrate the type of information that MaST produces for clinical staff about individual service users, clinical and team caseloads. The screen shots shown here use anonymised data, but staff can see this level of information for individuals on their caseloads, using their secure system logins.

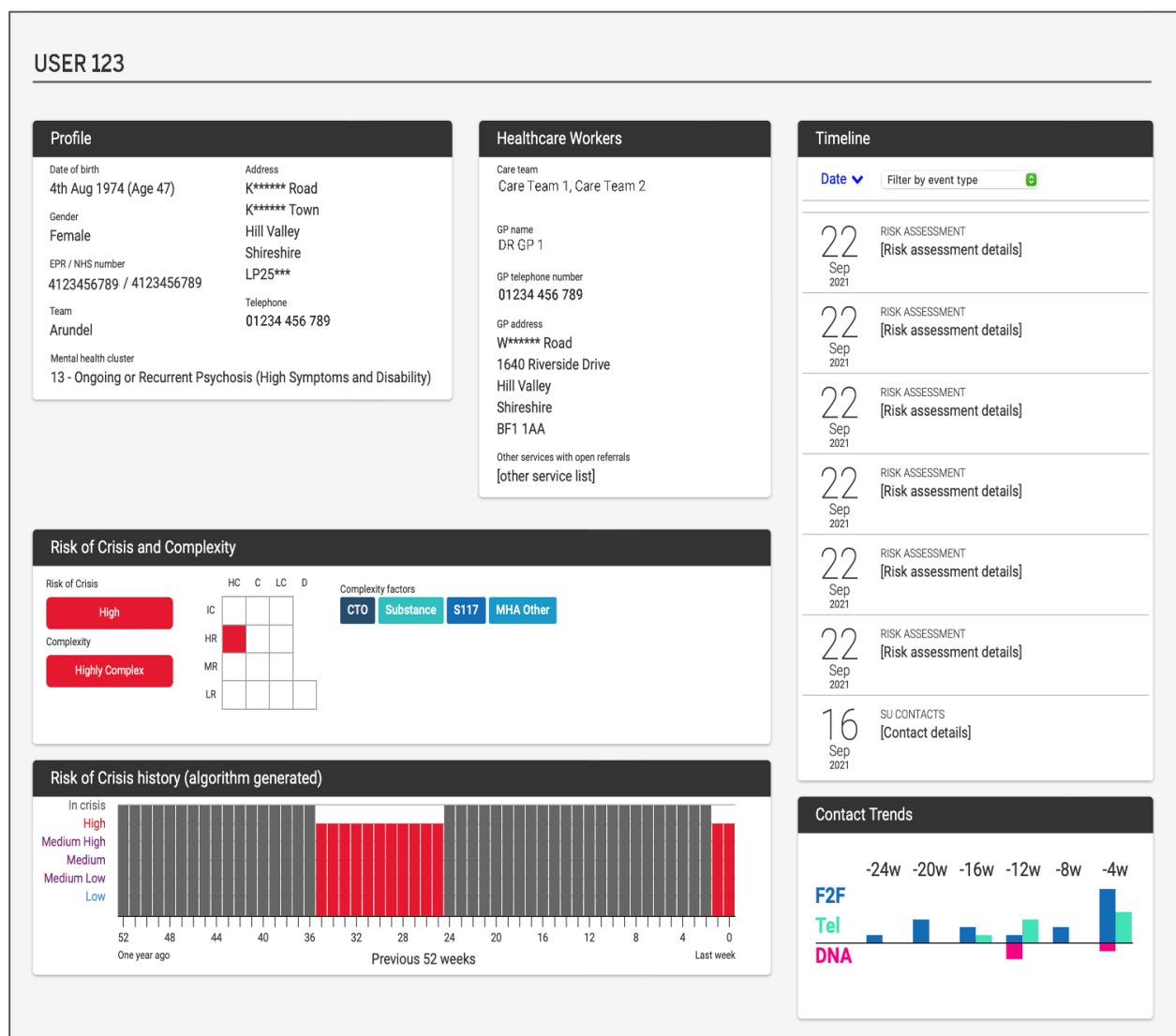
Understanding an individual service user

Figure 1 shows the dashboard for an individual service user. It shows how the algorithm calculates and presents their risk of crisis and complexity. The individual in this example has been at high risk of crisis for the past two weeks and had previously been in crisis for 22 weeks. The dashboard also provides information about the types of care contacts over time.

⁵ Data mining is the process of uncovering patterns and other valuable information from large data sets.

⁶ Machine learning is a subset of AI that focuses on learning, reasoning, and decision-making. The technologies use statistical models to make predictions (or decisions) without being explicitly programmed to perform the task. The computer 'learns' as it increases its data reference points.

Figure 1: Service user view⁷

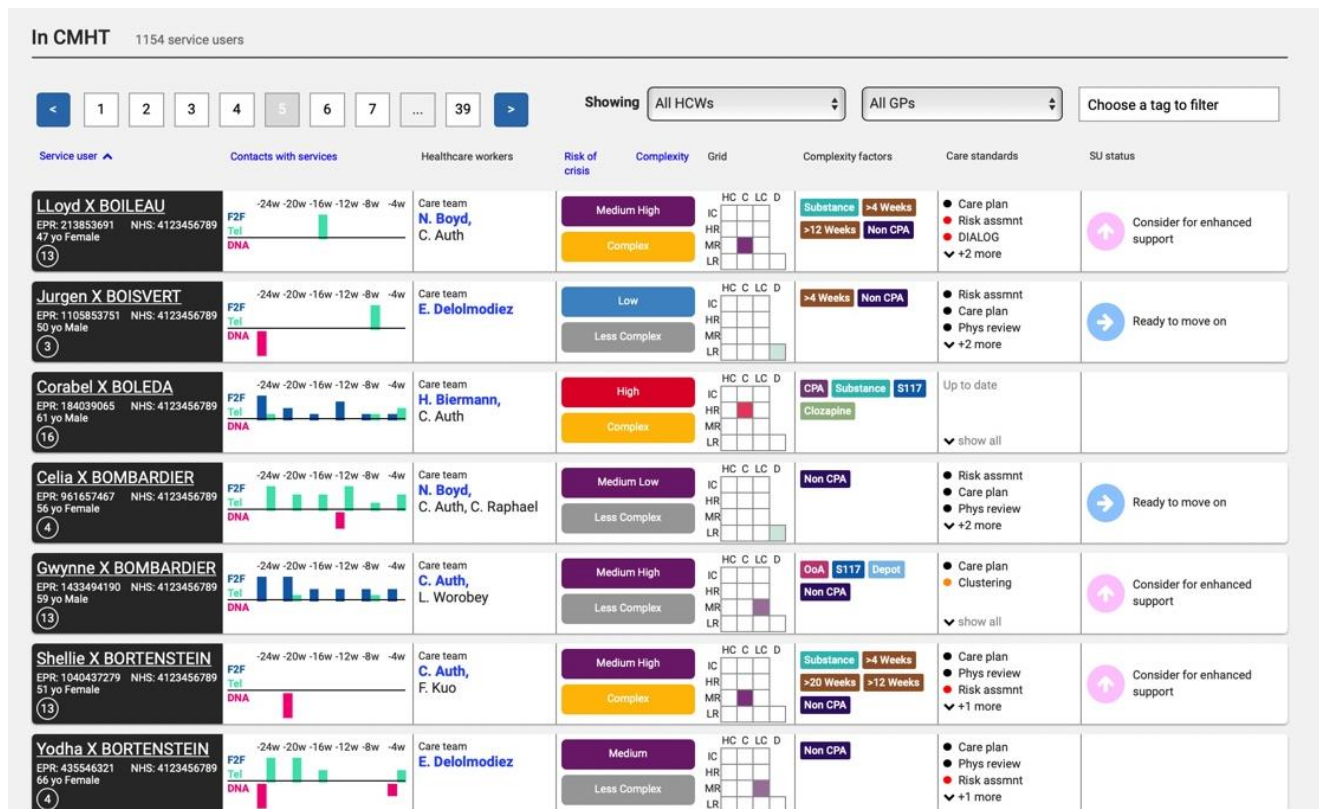


Understanding a clinician's caseload

Figure 2 shows an example of a clinician's individual caseload, allowing the staff member to review the risk of crisis and complexity on their caseload. The information can be sorted or filtered to find particular cohorts of services users who may be vulnerable or require action. MaST also 'nudges' the clinician if a decision about a change in care may be appropriate.

⁷ CTO and CPA definitions

Figure 2: Clinician's caseload view



Understanding the team caseload

CMHTs at Mersey Care can use MaST to gain a clear visualization of the makeup of their caseload at any point in time. By identifying those who are more at risk of crisis, the teams can allocate additional resources for those people needing stepped-up care.

MaST also takes into account the complexity of service users based on other factors including substance misuse and safeguarding concerns. The tool produces a grid for each CMHT team, categorising their caseload by risk of crisis and complexity factors (figure 3).

Figure 3: Example of team caseload categorised by risk of crisis and complexity factors

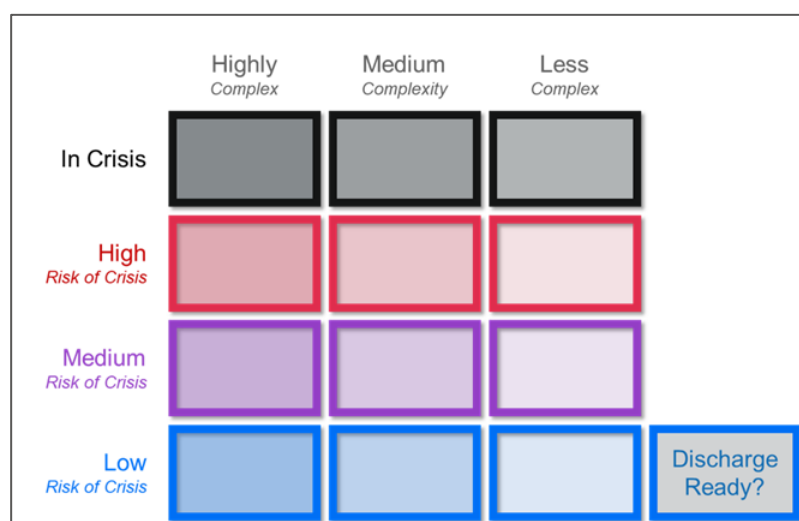


Figure 4 shows an example of an overview of a whole team’s caseloads and workflow. This information can help the team to allocate resources effectively. It shows:

- the number and the length of time the people on the caseload have been in assessment, on the teams’ caseload or have been recently discharged
- the number in crisis services, those recently discharged from inpatient services and the assessed risk of crisis of those service users
- those service users whose risk of crisis or complexity indicates a change in levels of care, such as stepping up or stepping down from CPA⁸ or being discharged from the CMHT to a more appropriate service.

The CPA is now being phased out of services nationally, and MaST is being adapted to reflect the revised approaches outlined in the national community mental health framework.⁹

Figure 4: Team view

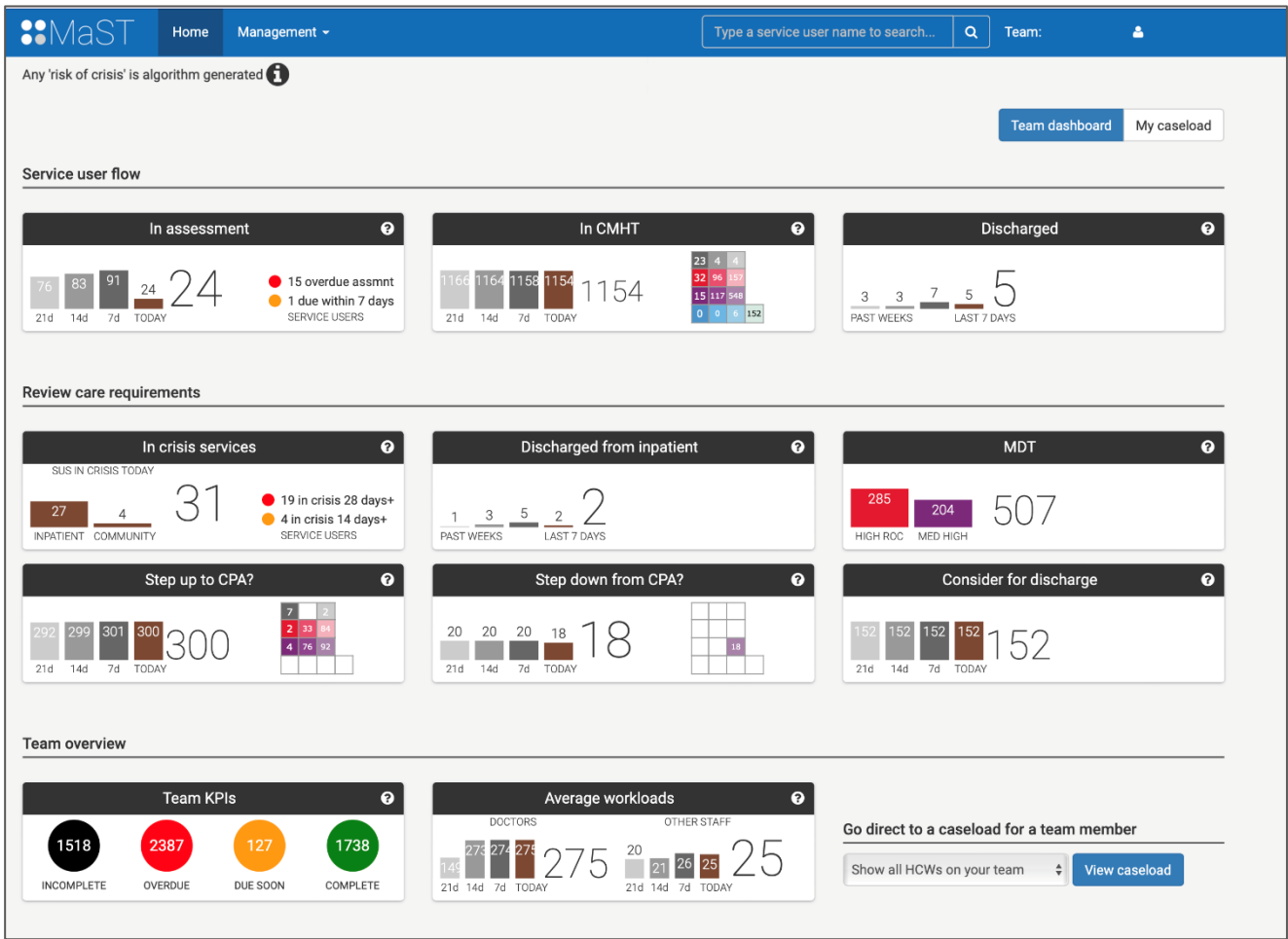


Figure 5 provides a view of those service users who have been assessed as currently being in crisis in a team. In this example the dashboard lists the five service users in crisis on Ward A, together with the length of the crisis, the complexity factors for each of them and what actions need to be undertaken.

⁸ The Care Programme Approach (CPA) is a package of care for people with severe mental health problems.
⁹ NHS England, *The community mental health framework for adults and older adults*, 2019

Figure 5: View of service users in crisis

Showing

All HCWs

All GPs

Choose a tag to filter

Inpatient

Community

Service user

Crisis start date

Last CMHT contact

Inpatient unit

Healthcare workers

Risk of crisis

Complexity

Risk/complexity

Complexity factors

Care Standards

USER 234

EPR: 123456789

NHS: 123456789

33 yo Male

12

8

months ago

08 Aug

7

months ago

13 Sep

Inpatient unit

A Ward

Care team

C. Team

In Crisis

Highly Complex

HC C LC D

IC

HR

MR

LR

S117

MHA Other

Clozapine

Up to date

show all

USER 235

EPR: 123456789

NHS: 123456789

33 yo Male

12

9

months ago

09 Jul

7

months ago

21 Sep

Inpatient unit

A Ward

Care team

C. Team

In Crisis

Highly Complex

HC C LC D

IC

HR

MR

LR

Substance

S117

MHA Other

Up to date

show all

USER 236

EPR: 123456789

NHS: 123456789

34 yo Male

7

1

year ago

30 Jan

7

months ago

03 Sep

Inpatient unit

A Ward

Care team

C. Team

In Crisis

Highly Complex

HC C LC D

IC

HR

MR

LR

Substance

S117

MHA Other

CPA/Non CPA Review

show all

USER 237

EPR: 123456789

NHS: 123456789

50 yo Male

17

8

months ago

27 Aug

7

months ago

07 Sep

Inpatient unit

A Ward

Care team

C. Team

In Crisis

Highly Complex

HC C LC D

IC

HR

MR

LR

Substance

MHA Other

Clustering

show all

USER 238

EPR: 123456789

NHS: 123456789

41 yo Male

13

2

years ago

21 Aug

8

months ago

22 Aug

Inpatient unit

A Ward

Care team

C. Team

In Crisis

Highly Complex

HC C LC D

IC

HR

MR

LR

Substance

S117

MHA Other

Care plan

show all

Implementation of MaST at Mersey Care

The implementation project brief for MaST stated that MaST would:

- support dialogue on the level of engagement with service users depending on the severity of their need
- help to assess suitability for discharge
- support managers to match staff skills to the caseload complexity and demand.

Building on these high-level objectives a plan was formulated to embed MaST within team processes to ensure that the expected outcomes were achieved. Examples are shown in figure 6.

Figure 6: Examples of how Mersey Care embedded the use of MaST in team processes

Process	Who and which task	Expected outcome
Pre-multi-disciplinary team meeting (MDT)	Practitioner checks pre-MDT which patients they should discuss in MDT	Prevents risky patients not being discussed; ensures right people are discussed
In MDT	Check riskiest patients; check patients most frequently seen	Ensures risky patients are discussed; ensures that risky patients are discussed in absence of the care coordinator
Allocation	Managers allocate according to caseload weight, not just size	Ensures safe caseload sizes, fair allocation, and awareness of dangerous caseloads
Transformation reviews (discharges)	Manager and medics to identify discharge from service	Ensures that caseloads reduce; leads to better clustering if inaccurate discharges are re-clustered

Making the case for investment

Pilot stage

As noted earlier, Mersey Care received GDE funding to implement MaST in two early adopter CMHT hubs. The GDE programme involved a substantial application process and numerous projects were considered to achieve the overall vision. The goals included in the proposal which cited MaST were:

- develop information-based management tools to support continuous improvement and inform care-based decision making
- develop clinician and team-level quality dashboards and other information management tools.

Once Mersey Care had been granted the GDE funding, a market assessment, options appraisal, and evaluation plans were prepared prior to commissioning MaST via G-Cloud.¹⁰

Scaling up the project

At the end of the pilot phase, the Mersey Care GDE team prepared a further business case for scaling up MaST for use in all CMHTs which incorporated the results of qualitative evaluations and health economics modelling. These are described in the next section.

More recently, following the completion of the GDE funded programme, a further business case was prepared, which has resulted in a three-year programme of work supporting the roll out of MaST to additional services and the evolution of MaST to support the implementation of the national community mental health framework.

Evaluating the benefits of digital investment

Evaluating the effectiveness of a digital investment following implementation is key to ensuring that resources are used wisely in the NHS. Have the benefits set out in the business case been realised? In the case of MaST, the initiative has been evaluated both internally and externally.

Internal evaluation

The trust's end of project closure report was completed in January 2020. It included:

- views of clinicians
- changes to service delivery
- benefits realised
- lessons learned.

Views of clinicians

The clinical leads at Mersey Care reported that MaST supports them to manage community services better by:

- enabling them to view of the level of complex caseloads to identify that there is sufficient capacity for CMHTs to support the total presenting caseloads.
- providing clear visibility on those service users who are likely to use crisis services within the next 28 days
- identifying those service users for whom there are additional levels of complexity in their life, for example, they are homeless or are looking after a young child
- highlighting which staff are carrying highly complex caseloads and who has capacity to take on new service users
- replacing the traditional workarounds such as zoning boards (displaying a team's caseload of service users on a white board with different traffic light-coloured zones according to the

¹⁰ The G-Cloud is a set of simple and legally compliant frameworks that enable NHS organisations to buy ICT services more quickly and efficiently than traditional procurement methods and was used for the original contract for MaST.

support they need), excel spreadsheets and reducing requests to business intelligence teams for timely data

- providing the right intelligence to make safer decisions on step down and discharge
- ensuring consistency right across the trust
- helping to identify unmet need
- providing visibility on key performance metrics e.g., those recently discharged from inpatient care who need to be followed up.

'MaST provides a solution for clinicians and service managers to understand what is going on in the caseload right now and identify complexity and risk.'
(Service lead)

'It provides a safer service – helps identify people that may be missed.'
(Team leader)

External evaluation

An evaluation to examine the impact of MaST at Mersey Care was commissioned from the Health Economic Unit (HEU)¹¹ by the Innovation Agency.

The evaluation used anonymised patient-level and monthly aggregated mental health services data provided by the trust. The data covered the period from July 2017 to June 2021; however, the data prior to July 2018 was of poor quality and was therefore removed. Data quality improved after the introduction of a new electronic patient record system in 2018.

Estimations made by the evaluation team identify that the shift in activity from inpatient to crisis resolution and home treatment team (CRHT) may have resulted in an efficiency saving of £1.7 million in the six-month period following MaST implementation. Assumptions were based on a person having on average one contact per day with a consultant-led CRHT while experiencing a mental health crisis in the community.

The HEU acknowledged that a key challenge for their evaluation had been to separate the impact of MaST from the data quality concerns, the impact of the pandemic and the wider system changes that had happened within Mersey Care, such as the establishment of the crisis resolution home treatment pathway. However, the HEU states there is some evidence to suggest that MaST can enable proactive care of service users and has the potential to reduce mental health crises and generate service efficiencies. Appendix A lists the metrics used by the HEU in its evaluation.

Future plans

Mersey Care are now working with Holmusk to develop MaST to support the implementation of the *community mental health framework*, which supports the delivery of the *NHS Long Term Plan's* vision for a place-based community mental health model.

¹¹ The HEU is hosted by the Midlands and Lancashire Commissioning Support Unit

This includes:

- the introduction of enhanced care pathways which are intended to deliver a successful progression from the use of CPA
- the introduction of patient-reported outcome measures such as DIALOG and DIALOG+¹²
- a focus on re-engaging service users who may have recently lost their connections with services
- a joined-up approach to insights by including primary care and voluntary sector partners in the use of MaST to enable informed decision making.

How to find out more

Please contact:

Mersey Care NHS Foundation Trust Communications Team on 0151 471 2336 or email communications@merseycare.nhs.uk

Caroline Gadd, Managing Director, Holmusk (MaST) on 07826913269 or email caroline.gadd@holmusk.co.uk

¹² <http://impulse.qmul.ac.uk/dialog/>

Appendix A

Summary of the key findings from the HEU evaluation

Metric	Definition	EHU assessment
CMHT discharge	Number of discharges per month divided by the number of service users	Remained stable during and immediately after introduction of MaST
CMHT readmission	Number of readmissions within 90 days of discharge per month divided by the number of service users	HEU stated it had been difficult to establish a trend pre-MaST because of data cleansing
Mental health crisis episodes	Number of mental health crisis episodes initiated per month	Mental health crisis rates declined during and after the introduction of MaST, other than some spikes related to Covid19 lockdown periods
Community crisis duration	Number of days under the care of the CRHT team	Increase in duration to 7 days in 10 versus 3 pre-MaST
Inpatient crisis length of stay	Number of days in hospital	Reduction in mean duration to 3 days in 10 versus 7 pre-MaST
Quality and safety performance indicators		
Care plan review	Percentage of service users receiving a care plan review within 12 months	This was expected
Care Programme Approach (CPA) review	Percentage of service users receiving a CPA review within 12 months	This was expected to increase following MaST, but this decreased. (Could have been a reduction in face-to-face contacts, redeployment of staff or prioritisation of care plan reviews)
Physical health check	Percentage of service users receiving a physical health assessment within 12 months	Increased after the introduction of MaST but slowed during the pandemic which may reflect challenges of doing in person assessments
Risk assessment	Percentage of service users receiving a risk assessment within 12 months	Trend remained constant
Direct care contacts	Percentage of service users contacted by the CMHT service within 4, 8, 12 or 20 weeks.	Improvement in the percentage being contacted within an appropriate time frame
Direct care contacts – vulnerable service users	Percentage of vulnerable service users contacted by the CMHT service within 4 weeks. Vulnerable service users	

Metric	Definition	EHU assessment
	identified by MaST system using agreed set of criteria.	
48-hour follow-up	Percentage of service users admitted to hospital due to mental health crisis who were followed up within 48 hours of discharge	48-hour trend had been increasing prior to MaST introduction and the trend continued. By May 2021 84% of service users were followed up within 48 hours against 64% in July 2018
7-day follow-up	Percentage of service users admitted to hospital due to mental health crisis who were followed up within 7 days of discharge	Similar trend for 7 day follow ups

This case study is part of the *Delivering value with digital technologies* programme that the HFMA is undertaking, supported by Health Education England. The programme aims to increase awareness amongst NHS finance staff about digital healthcare technologies, and enable finance to take an active role in supporting the use of digital technology to transform services and drive value and efficiency. For more information click [here](#).

About Health Education England

Health Education England (HEE) is part of the NHS, and we work with partners to plan, recruit, educate and train the health workforce. HEE exists for one reason only: to support the delivery of excellent healthcare and health improvement to the patients and public of England by ensuring that the workforce of today and tomorrow has the right numbers, skills, values, and behaviours, at the right time and in the right place.

HEE's Digital Readiness Programme, commissioned by NHSX, aims to uplift digital skills, knowledge, understanding and awareness for all our health and care workforce. This includes:

- Supporting the right culture and environment, for example by ensuring digital is understood, embedded and championed at trust and ICS board level.
- Professionalising the digital workforce through support for professional bodies, regional Informatics Skills Development Networks, and collaborative community networks.
- Establishing learning and development through the NHS Digital Academy and specific learning and development initiatives, for example the Florence Nightingale Digital Nurse Scholarship, and through access to tailored, appropriate online learning for all.
- Building our future digital workforce by undertaking workforce analysis and demand forecasting, and sustainable models to recruit talent, for example through graduate schemes, as well as opportunities for nurturing existing talent, for example through the Topol Digital Health Fellowships.

For more information visit the [Digital Readiness Programme website](#) or follow the programme on Twitter [@HEE_DigiReady](#).

About the HFMA

The Healthcare Financial Management Association (HFMA) is the professional body for finance staff in healthcare. For over 70 years, it has provided independent and objective advice to its members and the wider healthcare community. It is a charitable organisation that promotes best practice and innovation in financial management and governance across the UK health economy through its local and national networks.

The association also analyses and responds to national policy and aims to exert influence in shaping the wider healthcare agenda. It has particular interest in promoting the highest professional standards in financial management and governance and is keen to work with other organisations to promote approaches that really are 'fit for purpose' and effective.

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