

Mental Health Joint Response Car

Evaluation Report (6 month)

Version history

Version	Date	Notes
1.0	2019-03-01	Initial version sent to stakeholders for feedback (3 month)
2.0	2019-04-26	Feedback incorporated and reviewed by SRO (3 month)
3.0	2019-09-27	Additional data analysed (6 month)

Report objective

This document seeks to document the context, methodology and results of the Mental Health Joint Response Car pilot.

Report RACI

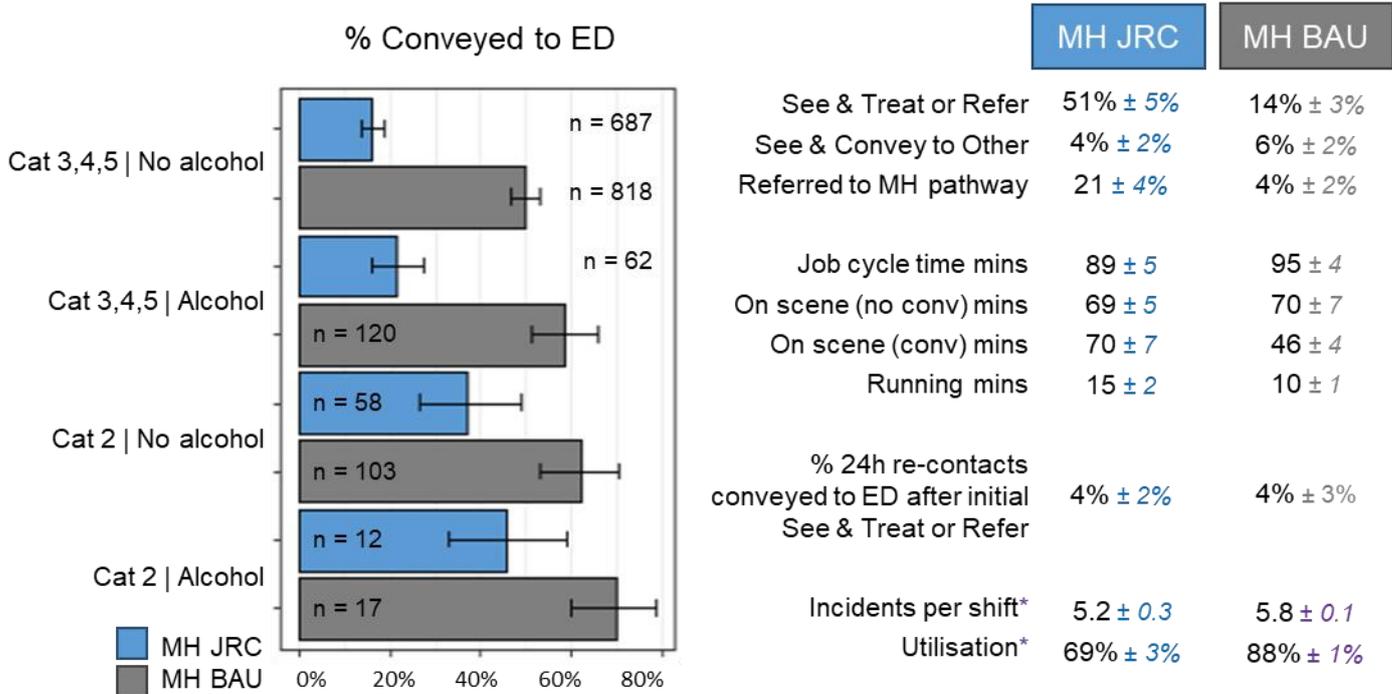
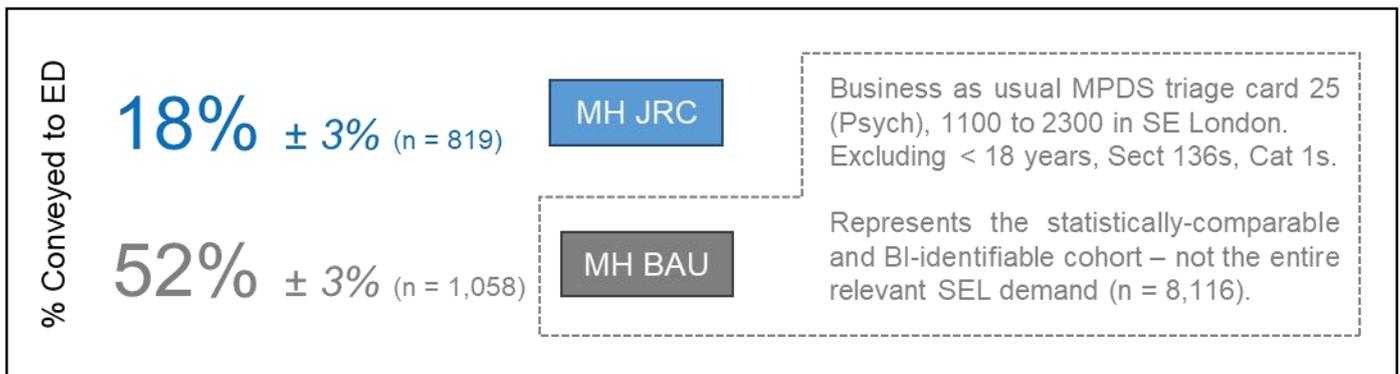
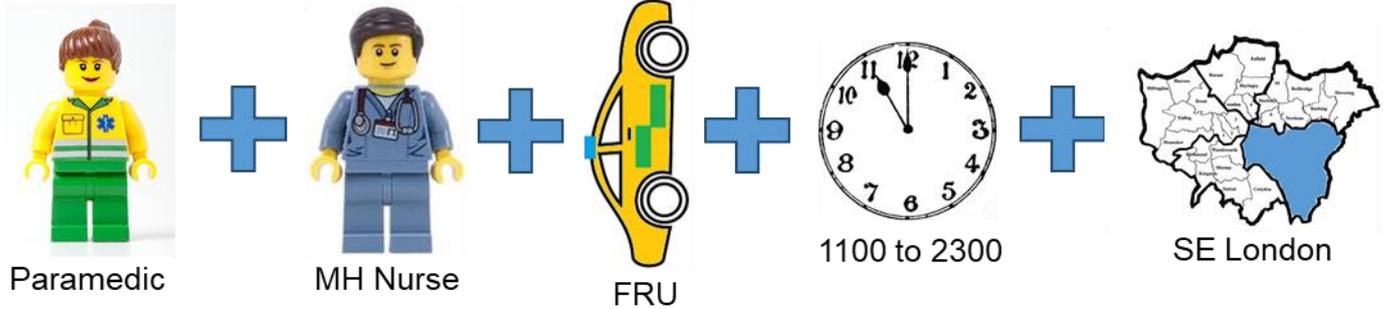
Responsible	Project Evaluation Lead – Alex Metcalf Project Clinical Lead – Carly Lynch
Accountable	Program SRO – Trisha Bain
Consulted	Strategy Operations Finance CARU EOC CHUB Performance
Informed	Project Steering Committee Programme Steering Committee



Mental Health Joint Response Car

Six month pilot | Evaluation Infographic

The MH JRC offers a specialist response to patients who have been identified as experiencing a Mental Health crisis



± error bands represent 95% confidence intervals

*DCAs working day-shifts in SEL (not strictly MH)

A paramedic – mental health nurse joint response is associated with lower rates of conveyance to an emergency department for mental health incidents: a pilot evaluation

Summary

Background: The Mental Health Joint Response Car (MHJRC) offers a specialist response to patients who have been identified as experiencing a Mental Health (MH) crisis.

Objective: To assess the impact on outcomes, safety and productivity of the new service through a pilot in South East London, relative to comparable Mental Health incidents receiving a business as usual (BAU) response.

Setting: The MHJRC attended its first incident on Monday 26 November 2018. Data was analysed for the 26 weeks (~6 months) up to and including Sunday 26 May 2019. The rota was based on a single vehicle 1100 to 2300 daily shift in a FRU car.

Comparison: A BAU response was based on calls triaged through MPDS card 25 (Psychiatric) in South East London with an on-scene arrival time between 11am and 11pm. Patients under 18 years old and incidents involving Section 136s, MH transfers or Category 1 acuity were excluded from analysis.

Methodology: Statistical regression models were employed to investigate differences between MHJRC and BAU groups. Where data was available, influence of potential confounders and effect modifiers was investigated.

Results: We hypothesised that this novel bespoke service would see a lower rates of conveyance to an Emergency Department (ED). This hypothesis was confirmed, with incidents seen by the MHJRC requiring ED conveyance 18% of the time, compared with 52% for a BAU response. Benefits remained when incident characteristics (C2 acuity, alcohol related) were held constant to allow a like-for-like comparison. To ensure a financially viable service, productivity metrics were also assessed. Despite a longer on-scene time when a conveyance was required, the MHJRC demonstrated a comparable overall Job Cycle Time (89 vs 95 minutes) thanks to its lower conveyance rate. Unexpectedly, on scene time, when conveyance was not required, was also comparable (69 vs 70 minutes). Higher rates of referral through MH pathways (21% vs 4%) was expected to cause the MHJRC to spend longer time on-scene, but this did not seem to be the case. The MHJRC managed to see an average of 5.2 incidents per shift, only marginally lower than the 5.8 average for Double Crewed Ambulances in South East London. A proxy for patient safety was assessed through recontacts where the outcome of the initial incident was See Treat or Refer, and patient went on to be conveyed to ED on a subsequent call within 24 hours. This metric was comparable between MHJRC and BAU incidents (4% vs. 4%).

Conclusion: With such promising benefits relative to the existing response, it is recommended to expand the MHJRC service to new settings and scales across London. The positive risk-taking culture at the heart of this service will rely on integrating skilled and experienced clinicians into the existing high-performing team. A gradual expansion is therefore recommended to ensure outcome metrics remain stable as the service scales.

Contents

Mental Health Joint Response Car	1
Summary	3
Introduction	5
Background	5
Objectives	6
Methods	7
Evaluation Design	7
Setting	7
MHJRC incident allocation	7
Comparison group for incident-based measures	8
Incident-based outcome measures	9
Comparison group for shift-based measures	10
Shift-based outcome measures	10
Potential confounders and effect modifiers	10
Data sources	11
Crew advice	12
Study size	12
Statistical methods	12
Results and discussion	14
Incident volumes	14
Incident characteristics	14
Shift characteristics	15
Primary results (simple model)	15
Primary results (confounder model)	16
Secondary results (incident-based outcomes)	17
Secondary results (recontact and conveyed to ED rate)	19
Secondary results (shift-based outcomes)	19
Category 1 inclusive MHJRC results	20
Limitations and conclusion	21

Introduction

Background

The London Ambulance Service (LAS) receives emergency calls and dispatches medical teams throughout the city of London. In 2018/19 we received ~1.95m calls and attended ~1.14m incidents. We are often the first point of care for patients experiencing a Mental Health (MH) crisis. In 2018/19, we received ~150k calls and attended ~100k incidents with an aspect of MH. We play a crucial role in risk assessment, and signposting patients to the most appropriate point of care or service. LAS has employed mental health nurses on its clinical hub to provide telephone advice to patients.

Mental Health calls are often complex, and take time and specialist expertise to manage effectively. Patients experiencing a mental health crisis may also be suffering from substance misuse which compounds the challenges faced by staff in carrying out a full assessment of the patients presenting condition and needs. Our crews sometimes have difficulty accessing appropriate care pathways for patients experiencing a mental health crisis. We know that some of these calls can tie up crews for many hours whilst they try to negotiate the many and varied pathways and services that may be needed. This often leads to patients being conveyed to an emergency department, which is rarely the correct environment for their effective assessment, management and a positive experience of care, and is often associated with extremely long lengths of stay and escalation of their presenting condition.

Our mental health pioneer service will see a Registered Mental Health Nurse (RMN), paired with a paramedic respond to patients who have been identified as experiencing a mental health crisis, or requiring a specialist mental health response.

A RMN would be able to provide specialist support to patients experiencing a mental health crisis. They would also be able to navigate the appropriate mental health pathways, especially out of hours, and would have the skills and knowledge to discuss risk assessments, recommended management plans and presenting condition with approved medical practitioners and mental health units. An RMN providing specialist assessment details can effectively access a wide range of appropriate care pathways. Furthermore, brief psychological interventions can be delivered with the aim of easing emotional distress. This will all mean that patients are able to be treated in the most appropriate way to meet their needs.

Combining the skill-sets of a Pre-hospital clinician with the Mental Health Nurse maximises the chances of being able to safely manage the patient in the community. Mental Health incidents are often complex, drawing on specialist skills and experience. It is believed Band 6 Paramedics have had more of an opportunity to develop these skills and receive exposure to engage in the positive risk-taking approach central to this model of care. Additionally, the service model provides a tangible career development pathway for Paramedic staff.

High standards of clinical performance monitoring and governance are key to the service development process. This includes existing trust-wide audit and governance processes / Clinical Performance Indicators relating to the discharge of patients in the community (as well as subsequent recontact events), as well as patients presenting with mental health symptoms. Additionally, there is a bespoke clinical audit work programme planned for the MHJRC in 2019/20. Cases where the standard of care falls below that expected are reported through the LAS Internal Incident Reporting System. Clinical oversight, in addition to oversight across aforementioned processes, is provided by the Consultant MH Nurse and MH Paramedic lead.

Objectives

Our objective was to assess the impact on outcomes, safety and productivity of the new Mental Health Joint Response Car (MHJRC) through a pilot in South East London.

It was hypothesised that relative to comparable MH incidents receiving a business as usual (BAU) response, the new service would have:

1. Lower rates of patients conveyed to an Emergency Department (as a result of more patients treated on scene and/or referred through alternative Appropriate Care Pathways)
2. Comparable safety outcomes
3. Comparable productivity metrics

Methods

Evaluation Design

A group of MH incidents was selected with a similar MPDS triage, acuity, spatial, temporal, and demographic profile for comparison.

Where metrics were more appropriately analysed on a shift-by-shift basis, such as crew utilisation and incidents seen per shift, DCAs in South East London were used for comparison.

Setting

The MHJRC attended its first incident on Monday 26 November 2018. The rota was based on a single vehicle daily 1100 to 2300 shift in a Fast Response Unit (FRU).

Data for analysis was extracted from the LAS Data Warehouse on Monday 15 July 2019. Data was analysed for the 26 weeks between Monday 26 November 2018 and Sunday 26 May 2019.

The evaluation plan had anticipated having to exclude the initial couple of weeks as a start-up period while the pilot sorted out unanticipated issues and settled into a more consistent pattern of work. However, based on anecdotal reports from the project lead and from a review of incident characteristics and metrics (analysis not shown), this initial period was not suspected of being substantially different from the rest of the pilot. This is put down to the several test shifts run by the project lead prior to the start of the pilot period addressing most potentially unanticipated issues. This period was included in the main analysis.

MHJRC incident allocation

The South East desk allocators in the EOC played a crucial role in selecting appropriate calls to dispatch the car to. Mental health crisis calls in the South East sector were prioritized. If the CHUB Mental Health Nurse identifies that a patient would benefit from face to face assessment by the MHJRC, they would flag the CAD to the allocator. On occasion, the MHJRC crew would use the Geotracker software application to identify potentially appropriate calls, which would be flagged to the sector allocator.

An estimation of allocation proportions was provided by the project lead:

Method	% allocations (estimate)
Standard sector allocation process	70%
Flagged as appropriate via EOC MH Nurse, allocation by sector dispatch	25%
Flagged as appropriate via crew on MHJRC, allocation by sector dispatch	5%

Table 1. Estimated allocation method of incidents to the MHJRC

Comparison group for incident-based measures

Comparable MH incidents receiving a Business as Usual (MH BAU) response were defined using the following criteria:

Criteria	Detail
MPDS triage card 25 (Psychiatric)	<ul style="list-style-type: none"> - A large proportion of incidents triaged via Card 25 should be relevant for the MHJRC to attend. - A small proportion will be inappropriate, for example, incidents requiring a conveyance under Section 136. - It should be noted that Card 25 only represents a small portion of incidents that will be relevant for the joint response to attend. For example, this will not capture calls from 111 or MPS or calls reclassified by CHUB. This is because data is not captured at the time of the call that allows differentiation between 111 mental health and 111 non-mental health calls. Despite the absence of captured data, EOC will (often) still be able to identify mental health calls and dispatch appropriately. - It should also be noted that overdoses often have a component of Mental Health, however should be captured separately on triage Card 23. Overdoses are less appropriate to be seen by the MHJRC so the BAU group did not include Card 23.
South East London call location	<ul style="list-style-type: none"> - The MHJRC was predominately, but not exclusively based in South East London. - Calls originating in South East London will share similar Appropriate Care Pathways. - All references to location in this report refer to the location of the patient/incident, not the sector of the LAS responding vehicle.
11am to 11pm on-scene arrival time	<ul style="list-style-type: none"> - The MHJRC ran predominantly, but not exclusively on a daily 11am to 11pm rota. - Responses during similar hours will share similar Appropriate Care Pathways.
Excluded: Patient under 18 years old	<ul style="list-style-type: none"> - The MHJRC predominantly, but not exclusively, attended patients over 18 years old. - The training and experience of the current MH Nurses was more focused towards adult mental health.
Excluded: Section 136s	<ul style="list-style-type: none"> - Incidents where a patient requires conveyance under Section 136 should receive a response by a vehicle with conveying capability. The vehicle used by the joint response team during the pilot did not meet this criteria.
Excluded: Mental Health transfers	<ul style="list-style-type: none"> - Incidents where a Health Care Professional have requested the conveyance of a patient should receive a response by a vehicle with conveying capability. The vehicle used by the joint response team during the pilot did not meet this criteria.
Excluded: Category 1 acuity calls	<ul style="list-style-type: none"> - Category 1 incidents should receive a response by a vehicle with conveying capability. The vehicle used by the joint response team during the pilot did not meet this criteria. - As the MHJRC was staffed by a Paramedic, the crew was able to be auto-dispatched to Category 1 calls, but data from these incidents was analysed separately.

Table 2. Criteria for defining comparison group for incidents receiving a BAU response

Incident-based outcome measures

Incident-based outcome measures of interest included:

Focus	Measure	Detail
Primary	See and convey to ED	Face to face incidents where at least one patient was conveyed to an Emergency Department by an LAS vehicle for immediate care.
Secondary	See and treat or refer	Face to face incidents with disposition description containing the string 'refer' or disposition codes 9002 (treated but not conveyed), 9010 (assisted but not conveyed) or 9011 (GP call/left in care)
Secondary	See but declined against advice	Face to face incidents with disposition code 9001 (declined against advice)
Secondary	See but no trace	Face to face incidents with disposition code 9013 (no trace)
Secondary	See but not required	Face to face incidents with disposition code 9090 (not required)
Secondary	See other	Face to face incidents not meeting criteria for other 'See' categories
Secondary	See and convey to Other	Face to face incidents where at least one patient was conveyed to non-Emergency Department pathway by an LAS vehicle for immediate care.
Secondary	Referral to MH Pathway	Face to face incidents where referral to external MH team code (9031) noted on PRF.
Secondary	Referral to GP	Face to face incidents where referral to GP code (9021) noted on PRF.
Secondary	Job cycle time	Minutes from allocation to green
Secondary	On-scene time (Non-conveyance)	Minutes from arrival on scene to green
Secondary	On-scene time (Conveyance)	Minutes from arrival on scene to left scene (conveying vehicle) or green (remaining vehicle/s)
Secondary	Running time	Minutes from tires moving to arrival of a vehicle on-scene
Secondary	Multiple attendance ratio	LAS vehicles that arrived on scene to an incident. Taxis are excluded from this metric.
Secondary	Recontact and Conveyed to ED rate	<p>Numerator: Recontacts where the outcome of the initial incident was See Treat or Refer, and patient went on to be conveyed to ED on a subsequent call within 24 hours.</p> <p>Denominator: Incidents where the outcome was See Treat or Refer</p> <p>See Treat or Refer: Face to face incidents with disposition description containing the string 'refer' or disposition codes 9002 (treated but not conveyed), 9010 (assisted but not conveyed) or 9011 (GP call/left in care)</p> <p>Recontacts: Based on geographical location of initial and subsequent call. Patient name and date of birth from PRF was used to confirm</p>

		incidents involved the same patient. While metric has several limitations, both limitations are expected to apply equally across both MHJRC and BAU groups.
--	--	---

Table 3. Incident-based outcome metrics

Comparison group for shift-based measures

Where metrics were more appropriately analysed on a shift-by-shift basis, DCAs working day shifts in South East London were used for comparison.

These shifts will include all types of incidents, not exclusively mental health incidents.

Shift-based outcome measures

Shift-based outcome measures of interest included:

Measure	MHJRC	SEL DCAs
Incidents per shift	On-scene responses during a 12 hour shift.	On-scene responses per 12 hour day shift of DCAs in SEL.
Utilisation	Minutes worked on calls divided by minutes available for calls. Takes into account out of service time.	Minutes worked on calls divided by minutes available for calls. Takes into account out of service time.

Table 4. Shift-based outcome metrics

Potential confounders and effect modifiers

The following factors were flagged by the Project Lead as being potential confounders or effect modifiers. Most factors were identified in the Evaluation Plan, prior to the start of the pilot.

Factors considering alcohol related incidents, patient location, MHN staffing of the CHUB, and Consultant MHN staffing of the MHJRC were identified during the course of the pilot. All other factors were identified before the pilot started during the scoping phase.

Factor	Detail	Identified in Evaluation Plan	Data available
Patient age	Elderly patients are more likely to have physical health comorbidities so may be more likely to require conveyance	Yes	Yes
Patient sex	Not expected to be a potential confounder, but included in statistical analysis to confirm not the case	Yes	Yes
Triage acuity	Incidents triaged at a higher acuity are more likely to require conveyance	Yes	Yes
Alcohol related incidents	Patients deemed drunken but capable may be more likely to require conveyance	Yes	Yes
MHN staffing of the CHUB	Initial business case modelling assumed a MHN staffed CHUB in addition to the MHJRC. Due to staffing capacity limitations during the pilot, the CHUB was staffed by a MHN only part of the time (~50% incidents had MHN CHUB staffing at time of MHJRC activation). This factor was included to help estimate its impact on the MHJRC effect size.	No	Yes

Consultant MHN staffing of the MHJRC	The Consultant MHN brings a high level of clinical skill and knowledge to the response to MH incidents. Due to staffing capacity limitations during the pilot, the Consultant MHN staffed the MHJRC more than anticipated during the first 3 months of the pilot. This factor was included to help estimate its impact on the MHJRC effect size.	No	Yes
Patient at home	Patients not at home may be more likely to require conveyance. Due to data capture limitations, this factor could not be identified consistently.	Yes	No
Patient medical/mental health history	Patient medical/mental health history is expected to impact presenting acuity, and therefore likelihood of requiring conveyance. Due to the limitations of a paper-based Patient Report Form, limited data was available to investigate this factor.	Yes	No
Appropriate Care Pathway availability	The ability for Clinicians to discharge or refer on scene relies on the availability of Appropriate Care Pathways. Mitigation was attempted through comparison group inclusion criteria that considered incidents from the same date range, a similar time of day and a similar part of London (South East).	Yes	No
LAS or NHS other initiatives	It is plausible initiatives external to the pilot could have contributed to observed benefits. Mitigation was attempted through comparison group inclusion criteria that considered incidents from the same date range, a similar time of day and a similar part of London (South East).	Yes	No

Table 5. Potential confounders and effect modifiers

Data sources

Data from the time of the call is captured through the Command Point application. This includes call start time, patient age, patient sex, incident location, MPDS triage category, and DoH acuity category.

Data from the time of the response is captured through a combination of the Mobile Data Terminal and the Patient Report Form. This includes callsigns that arrived on-scene, dispatch/on-scene/job-cycle times, and conveyance or referral destinations.

Mental Health Section 136 and Alcohol-related incident flags are based off a combination of Command Point call notes, MPDS categories, and Patient Report Forms, in methods established by Business Intelligence. Section 136 flags are reviewed by the Data Quality team.

Where multiple responders arrived onscene, the responder type was derived from the vehicle that stopped the clock as per BI logic based on AQI guidelines.

Incidents with non-Mental Health illness codes were defined as incidents with at least one illness code, excluding:

1. Confusion/distressed/upset (14)
2. Psychiatric problems – diagnosed (40)
3. Psychiatric problems-other (41)
4. Unable to cope (66)
5. No injury or illness (91)
6. Acute behavioural disturbance / excited delirium (120)

Crew advice

On occasion, the MHJRC provided advice to crews over the phone (so will not have arrived on scene). While such events are documented via the Patient Report Form, events were difficult to identify in the LAS Data Warehouse, due to some process variability between staff.

Events that were logged through the preferred process contributed to MHJRC utilisation, but won't contribute to measures of patient outcomes (e.g. conveyance rates), efficiency (e.g. JCT) or productivity (e.g. jobs per shift), as the inclusion logic required the MHJRC to arrive on scene. There were 39 crew advice incidents (<5% of incidents attended) that were logged in this fashion.

Events that were logged through an alternative process contributed to utilisation as well as patient outcomes, efficiency and productivity, as these events were not able to be consistently differentiated from regular incidents where the MHJRC arrived on scene. Using a combination of logic excluding Cat 1 acuity incidents and with a 30 minute or less job cycle time threshold to reduce the likelihood of including running calls or where crew was left dealing, 12 incidents (<2% of incidents attended) were identified as possible crew advice events. It is unlikely this low volume of events had a material impact on the outcomes of this pilot.

The MH project team has since provided updated advice to MHJRC staff and updated the MHJRC Standard Operating Procedure to improve consistency around how this process is performed and captured moving forwards.

Study size

The primary objective of the pilot was to estimate the ED conveyance rate of the new service to an acceptable level of confidence.

Pre-pilot trial shifts suggested the MHJRC might be able to see five incidents per shift, with an ED conveyance rate of approximately 20%. A three month pilot was proposed by project stakeholders, which would have resulted in approximately 400 incidents seen by the MHJRC. The 95% confidence interval of the rate under such assumptions would have been approximately 16% to 24% (20% ± 4%), which was considered acceptable by the project team.

It should be noted hypothesis tests around secondary metrics may be under-powered and may not have sufficient sample sizes to detect statistically significant effects.

Statistical methods

A MHJRC/BAU only model considered pilot status as a binary predictor.

A more complex confounder model also considered patient age, sex, alcohol flagged incidents, triage acuity, whether the CHUB was staffed with a MHN, and whether the Consultant MH Nurse was working on the MHJRC – all in addition to whether the MHJRC attended).

Potential confounders were investigated for effects across both MHJRC and BAU groups as a whole, as well as for MHJRC-specific (or BAU-specific) effects. Factors were considered significant where

regression coefficients were two standard errors away from zero. Factors that showed significance were investigated for between-factor interactions.

As ED Conveyance was the metric of primary interest, and to reduce the risk of reporting under-powered findings, secondary metrics were analysed using the MHJRC/BAU model only.

Confidence intervals were calculated for the primary metric using a false positive error rate of 0.05. Confidence intervals were calculated for secondary metrics incorporating a Bonferroni correction for multiple testing, using a false positive error rate of 0.004 on individual calculations.

Binary outcome variables were analysed using logistic regression. Continuous outcome variables were analysed using linear regression.

Results and discussion

We evaluated outcomes of the novel pre-hospital Mental Health Joint Response Car at LAS.

Incident volumes

During the analysis period, the MHJRC attended 864 incidents. 819 of these 864 incidents remained once Category 1 acuity incidents were excluded.

The BAU group of 1,058 incidents was based on a subset of the 589,219 total face to face incidents seen by LAS during the period.

Proportion	Criteria
438,259 of 589,219	Had MPDS (excluding 111) available
10,167 of 438,259	Were Triage Card 25 (Psychiatric) incidents
2,357 of 10,167	South East London only
1,489 of 2,357	Received a response between 11am-11pm
1,333 of 1,489	Excluding under 18 Excluding transfers Excluding Section 136 Excluding Category 1
1,058 of 1,333	Excluding incidents seen by MHJRC

Table 6. Incident subset volumes of the BAU group

The fact that the MHJRC and BAU volumes are similar is by coincidence, not by design.

During the pilot period there were 51,093 incidents flagged as Mental Health by Business Intelligence across LAS. 37,162 of these incidents were deemed MHJRC appropriate (Under 18, transfers, Section 136, Category 1 and Triage Card 23 Overdose all excluded).

Criteria	Incidents flagged by BI as MH	MHJRC appropriate incidents flagged by BI as MH
Triage Card 25 Psychiatric	10,120	9,090
Triage Card 23 Overdose	7,883	0
PRF MH	17,508	14,285
Call log text search	15,582	13,787
TOTAL	51,093	37,162

Table 7. Business Intelligence Mental Health flag criteria breakdown

Table 7 was calculated using IF ELSE cascading logic to avoid double counts. This logic was chosen to illustrate the large volume of calls flagged only through call log text search.

This suggests the MHJRC saw 1.6% (819 / 51,093) of LAS Mental Health demand. 11,179 of 51,093 occurred in SEL. This suggests the MHJRC saw 7.3% (819 / 11,179) of SEL demand.

When considering incidents that are more appropriate to be seen by the MHJRC, the MHJRC attended 2.2% (819 / 37,162) of LAS and 10.1% (819 / 8,116) of SEL demand.

It is worth noting that the MH Flag algorithm was built in 2017 and could do with a review of its appropriateness and performance.

Incident characteristics

These characteristics were identified as potentially having confounding effects on outcome metrics such as ED conveyance rate.

Participant characteristics between groups were similar. Discrepancies of note included the MHJRC attending more attendances with the consultant MH Nurse (17% vs 0%).

Characteristic	MHJRC (%) n = 819 incidents	MH BAU (%) n = 1,058 incidents
Mean Age	40	43
Female (%)	412 (51%)	499 (47%)
Alcohol related (%)	74 (9%)	137 (13%)
Cat 2 acuity (%)	70 (9%)	120 (11%)
MHN CHUB staffed (%)	410 (51%)	471 (45%)
Consultant MH Nurse (%)	142 (17%)	-

Table 8. Incident characteristics

Rates of missing data for patient age was similar between MHC and BAU groups (7% and 5%, respectively). Rates of missing data for patient gender was similar between MHC and BAU groups (1% and 0%, respectively). The alcohol related incident flag defaults to 0, so no view is available on missing data.

91% (961 of 1058) of BAU incidents had the clock stopped by an AEU response.

27% (179 of 667) of non-Cat 1 incidents with an illness code recorded and seen by the MHJRC had a non-MH illness code noted (often in addition to a MH-related code). This illustrates the importance of the Paramedic to diagnose or discharge the physical component of patient presentations.

Category	Conveyed to ED	See & Treat or Refer	ELSE	Total
Seen by MHJRC excl. Cat 1	415	150	254	819
Illness code data available	397	146	124	667
Non-MH illness code (% of incidents where illness code was available)	80 (20%)	70 (48%)	29 (23%)	179 (27%)

Table 9. Breakdown of non-MH illness codes by incident outcome

The top 3 non-MH illness types (and number of incidents) for each category were:

Conveyed to ED	See & Treat or Refer	ELSE
Drug overdose (n = 20)	Alcohol related (26)	Alcohol related (6)
Cardiac arrhythmias (8)	Other medical conditions (13)	Purple + (3)
Other medical conditions (7)	Laceration/incision superficial (7)	Other medical conditions (3)

Table 10. Top non-MH illness types by incident outcome

Shift characteristics

There were 182 calendar days during the period of analysis. The MHJRC arrived on scene at least once during 166 of those 182 calendar days (91%). The MHJRC worked approximately full days (first activation before 2pm, last green after 8pm) 155 of those 166 days worked (93%).

The project Paramedic lead estimated that the majority of out of service time during the first three months was due to vehicle issues. During months four to six, out of service was mostly driven by MHJRC staff taking more leave (and not having sufficient staffing to cover unmanned shifts).

Primary results (simple model)

Of primary interest was the ability of the MHJRC to reduced pressure on Emergency Departments.

Model	MHJRC (95% CI) n = 819 incidents	MH BAU (95% CI) n = 1,058 incidents
MHJRC/BAU only model	18% (15%, 22%)	52% (49%, 55%)

Table 11. Primary results

After excluding Category 1 acuity incidents, 18% (149 of 819) incidents attended by the MHJRC were conveyed to an ED. The 95% confident interval for the underlying ED conveyance rate was between 14% and 25%. This compared favourably with the BAU response (48% to 58%) and demonstrates the benefits of the MHJRC.

Primary results (confounder model)

The following methodology and model provides a view of ED conveyance rates between the BAU and MHJRC groups in the context of potential confounders.

Factors considering patient age, patient sex, whether the CHUB was staffed by a MHN, and whether the MHJRC was staffed by the Consultant MHN were not found to have a significant effect in a regression of MHJRC attendance status on ED conveyance rates.

Factor	Significant
Patient Age	No
Female	No
Alcohol related	Yes
Cat 2 triage acuity	Yes
MHN CHUB staffed	No
Consultant MH Nurse	No

Table 12. Factors investigated for confounding effects

A more complex confounder model was fitted to include Alcohol related and Cat 2 triage acuity flags.

MH Response	Triage acuity	Alcohol related	Model Estimate	95% CI
BAU	Cat 2	No alcohol	62%	(53%, 71%)
BAU	Cat 2	Yes alcohol	70%	(60%, 79%)
BAU	Cat 3,4,5	No alcohol	50%	(46%, 53%)
BAU	Cat 3,4,5	Yes alcohol	59%	(51%, 66%)
MHJRC	Cat 2	No alcohol	37%	(27%, 49%)
MHJRC	Cat 2	Yes alcohol	45%	(33%, 59%)
MHJRC	Cat 3,4,5	No alcohol	16%	(14%, 19%)
MHJRC	Cat 3,4,5	Yes alcohol	21%	(16%, 28%)

Table 13. Conditional model estimates of ED Conveyance rates

Note that model estimates will differ somewhat from observed actuals, but serve to highlight the confounding effect of triage acuity and alcohol as factors.

The model indicated an interaction between Cat 2 and the MHJRC, suggesting that the MHJRC demonstrates a lower marginal benefit responding to Cat 2 incidents.

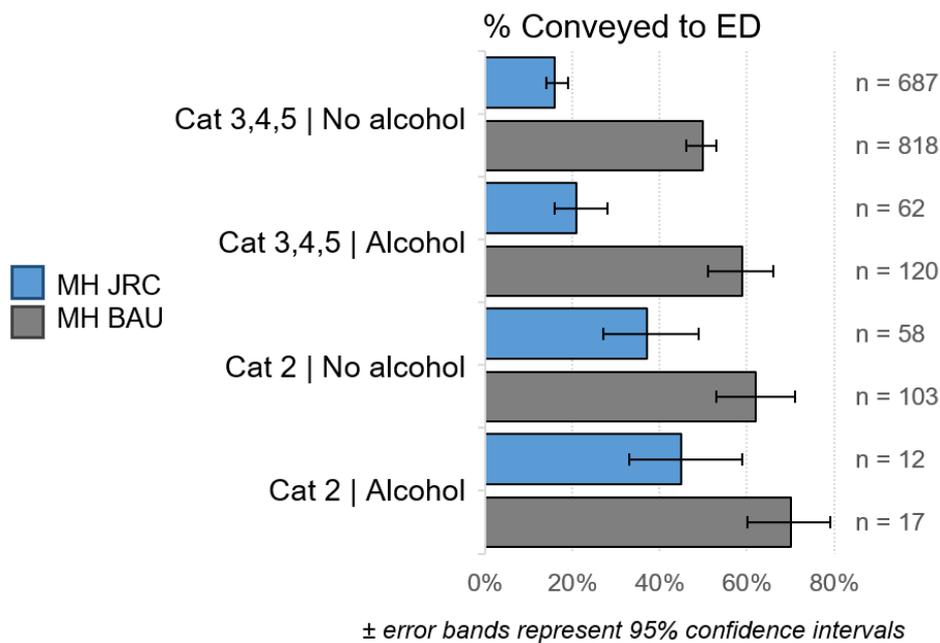


Figure 1. Conditional model estimates of ED Conveyance rates

The confounder model captures the effect of the following factors:

1. Higher acuity (C2) incidents are more likely to require conveyance to ED
2. Incidents flagged as involving alcohol are more likely to require conveyance to ED
3. The model indicated an interaction between Cat 2 and the MHJRC, suggesting that the MHJRC demonstrates a higher marginal benefit responding to Cat 3,4,5 incidents. Intervals represent 95% confidence intervals.

The model demonstrates the benefit of the MHJRC over a BAU response when incident characteristics are held constant so that a like-for-like comparison is being performed.

Secondary results (incident-based outcomes)

Model estimates were calculated for secondary metrics.

Metric	MHJRC (95% CI) n = 819 incidents	MH BAU (95% CI) n = 1,058 incidents
See and treat or refer	51% (46%, 56%)	14% (11%, 17%)
See but declined aid against advice	7.7% (5.4%, 10.8%)	8.1% (6.0%, 10.9%)
See but no trace	5.0% (3.2%, 7.7%)	5.6% (3.9%, 8.0%)
See but not required	4.8% (3.0%, 7.4%)	5.4% (3.7%, 7.8%)
See other	9.6% (7.1%, 13.1%)	8.5% (6.3%, 11.3%)
See and convey to Other	4.0% (2.5%, 6.5%)	6.2% (4.4%, 8.8%)
Referral to MH Pathway	21% (17%, 26%)	4.2% (2.7%, 6.3%)
Referral to GP	6.0% (4.0%, 8.9%)	2.8% (1.7%, 4.7%)
Job cycle time	89 (84, 94)	95 (91, 99)
On-scene time (Non-conveyance)	69 (64, 75)	70 (64, 77)
On-scene time (Conveyance)	70 (63, 78)	46 (42, 50)
Running time	15 (14, 16)	10.4 (9.6, 11.3)
Multiple attendance ratio	1.29 (1.24, 1.34)	1.09 (1.04, 1.13)

Table 14. Secondary results (incident-based outcomes)

Incidents attended by the MHJRC not resulting in a conveyance to an ED were predominantly resolved through See and Treat or Refer (51%).

This corresponded to a higher referral rate into external MH services (21%) relative to a BAU response (4.2%). This is a good outcome for the experience of the patient. If the MHJRC service scales, considerations should be made about how this is likely to redistribute the flow of patients and demand for services on the London MH trusts.

Rates of other outcomes including: See but declined against advice, See but no trace, See but not required, See other, and See and convey to Other, were comparable with a BAU response.

Unexpectedly, MHJRC non-conveyed incidents were not associated with a longer on-scene time (69 minutes) relative to a BAU response (70 minutes). Higher rates of referral through MH pathways (21% vs 4%) was expected to cause the MHJRC to spend longer time on-scene, but this did not seem to be the case.

MHJRC incidents requiring conveying had a longer on-scene time (70 minutes) relative to a BAU response (46 minutes). This difference is likely associated with having to wait for a conveying vehicle to arrive.

Having a single resource cover a specific subset of incidents over a large geographical area, it was expected that the MHJRC would have to travel longer for jobs. This was observed through a longer running time (15 minutes) relative to a BAU response (10.4 minutes).

The MHJRC had a similar job cycle time (89 minutes) relative to a BAU response (95 minutes). The MHJRC's longer on-scene time (when a conveyance was required), was offset by the lower overall conveyance rate.

Jct Component
 tohospitalandturnaround
 onscene
 running

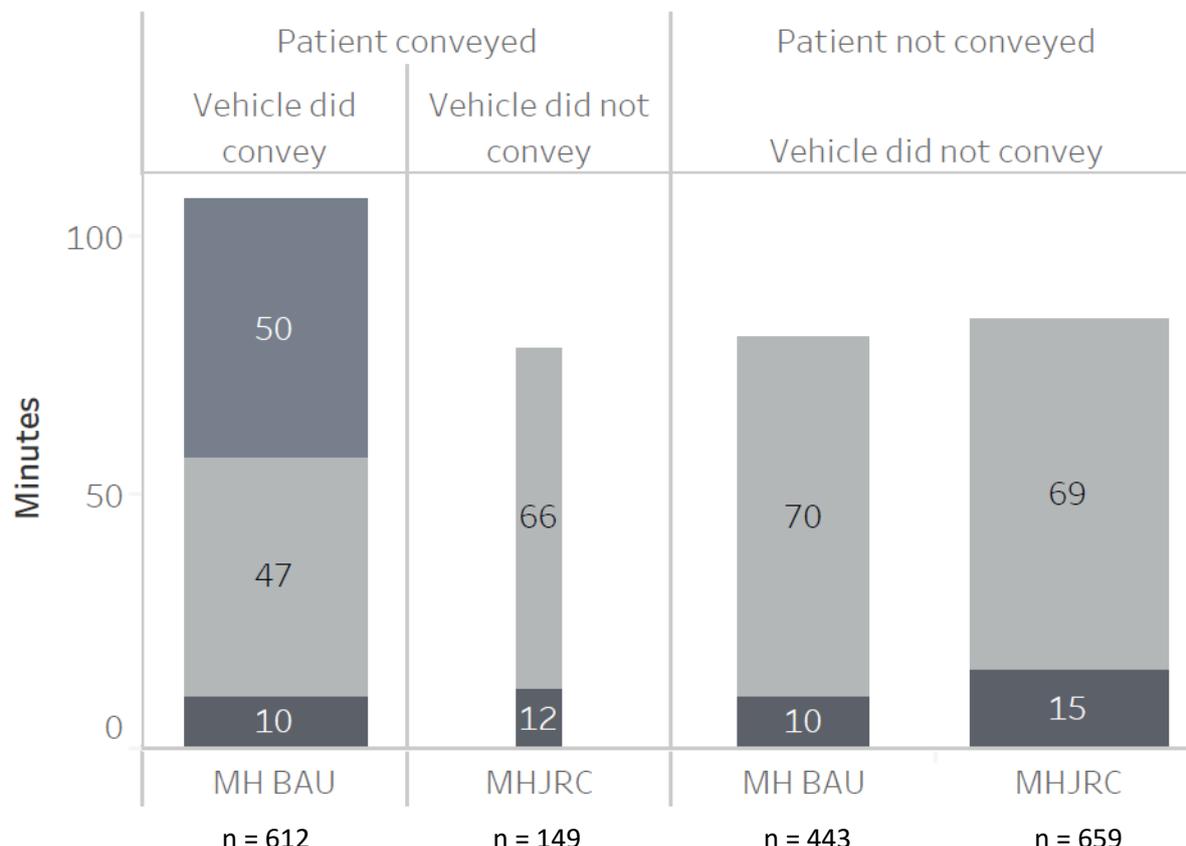


Figure 2. Job Cycle Time and its constituents by response and outcome

Attending incidents as a non-conveying response means that an additional resource is required if the decision is made to convey. This was reflected in a higher MHJRC multiple attendance ratio (1.29 on-scene responses) relative to a BAU response (1.09 on-scene responses).

Secondary results (recontact and conveyed to ED rate)

Model estimates were calculated for recontacts where the outcome of the initial incident was See Treat or Refer, and patient went on to be conveyed to ED on a subsequent call within 24 hours.

Metric	MHJRC (95% CI) n = 423 STR incidents	MH BAU (95% CI) n = 148 STR incidents
Recontact and conveyed to ED rate	4.1% (2.0%, 8.0%)	4.1% (1.3%, 12.3%)

Table 15. Secondary results (recontact and conveyed to ED)

A core enabler of this new service was allowing experienced clinicians to apply a positive risk-taking approach, where clinically appropriate. A similar recontact rate between MHJRC and BAU responses supports the premise that this way of working is not placing patients at significant extra risk.

Secondary results (shift-based outcomes)

The MHJRC had lower productivity and utilisation than a typical South East London DCA.

Metric	MHJRC (95% CI) n = 166 days worked	SEL DCAs (95% CI) n = 10,400 vehicle days worked
Incidents per shift	5.2 (4.9, 5.5)	5.8 (5.7, 5.9)
% Utilisation	69% (66%, 72%)	88% (87%, 89%)

Table 16. Secondary results (shift-based outcomes)

Category 1 inclusive MHJRC results

In the interest of performing as similar comparison as possible, Category 1 acuity incidents were excluded from both MHJRC and BAU groups. This was to evaluate the costs and benefits of the pilot at the margin.

It is still of interest to consider the performance the MHJRC in absolute terms – inclusive of Category 1 incidents.

Metric	Category 1 exclusive (n = 819)	Category 1 inclusive (n = 864)
See and convey ED	18%	19%
See and treat or refer	51%	49%
See but declined against advice	7.7%	7.9%
See but no trace	5.0%	4.7%
See but not required	4.8%	4.9%
See other	9.6%	10%
See and convey to Other	3.9%	3.8%
Referral to MH Pathway	21%	21%
Referral to GP	6.0%	5.9%
Job cycle time	89	88
On-scene time (Non-conveyance)	69	69
On-scene time (Conveyance)	70	68
Running time	15.4	14.9
Multiple attendance ratio	1.29	1.35

Table 17. MHJRC category 1 inclusion/exclusion comparison

There were only minor differences when analysing MHJRC inclusive or exclusive of Category 1 acuity incidents.

Limitations and conclusion

It was hypothesised by the project lead that the benefits of the MHJRC were likely due to a combination of the following elements:

Theme	Element
MH Nurse	Ability of the Mental Health Nurse to perform mental health assessments
MH Nurse	Ability of the Mental Health Nurse to deliver mental health crisis interventions
Culture	A culture of positive risk-taking approach enabled through a skilled and experienced team
Culture	A culture of professional trust enabled through the operation as a small close-knit team
Training	One week of specialist training before the start of the pilot
ACPs	Capacity and capability of Appropriate Care Pathways
ACPs	Staff knowledge of and a relationships with Appropriate Care Pathways
Allocation	Allocation of patients to the MHJRC i.e. potential cherry-picking of lower acuity incidents
Expectations	Use of a non-conveying vehicle impacting clinician and patient expectations around conveyance to an Emergency Department
Expectations	Expectation by staff of conveyance rate as a primary pilot evaluation metric

Table 18. Elements likely contributing to MHJRC benefits

This pilot did not seek to quantify the contribution of each element and the interactions between elements to the pilot benefits. Caution should therefore be applied when extrapolating the results from this pilot to different settings and scales.

The elements of most concern when considering expanding the service to a new setting are the capacity and capability of, and staff relationship with, Alternative Care Pathways in a new location.

The element of most concern when considering expanding the service to larger scales are the availability of sufficiently skilled and experienced clinicians, essential to the culture of positive risk-taking at the heart of this service. Additionally, the reduction in familiarity and professional trust built from time in a small close-knit team may also present challenges to establishing an optimal culture.

With this in mind, it is recommended to expand the service, albeit in a gradual fashion to confirm outcome metrics remain stable at scale.