



Short Report

Co-located Heroin Assisted Treatment within primary care: A preliminary analysis of the implications for healthcare access, cost, and treatment delivery in the UK

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ABSTRACT

Background: The UK is experiencing its highest rate of drug related deaths in 25 years. Poor and inconsistent access to healthcare negatively impacts health outcomes for people who use drugs. Innovation in models of care which promote access and availability of physical treatment is fundamental. Heroin Assisted Treatment (HAT) is a treatment modality targeted at the most marginalised people who use drugs, at high risk of mortality and morbidity. The first service-provider initiated HAT service in the UK ran between October 2019 and November 2022 in Middlesbrough, England. The service was co-located within a specialist primary care facility offering acute healthcare treatment alongside injectable diamorphine.

Methods: Analysis of anonymised health records for healthcare costs (not including drug treatment) took place using descriptive statistics prior and during engagement with HAT, at both three (n=15) and six (n=12) months. Primary outcome measures were incidents of wound care, skin and soft tissue infections (SSTIs), overdose (OD) events, unplanned overnight stays in hospital, treatment engagement (general and within hospital care settings) and ambulance incidents. Secondary outcome measures were costs associated with these events.

Results: A shift in healthcare access for participants during HAT engagement was observed. HAT service attendance appeared to support health promoting preventative care, and reduce reactive reliance on emergency healthcare systems. At three and six months, engagement for preventative wound care and treatment for SSTIs increased at the practice. Unplanned emergency healthcare interactions for ODs, overnight hospital stays, serious SSTIs, and ambulance incidents reduced, and there was an increase in treatment engagement (i.e. a reduction in appointments which were not engaged with). There was a decrease in treatment engagement in hospital settings. Changes in healthcare utilisation during HAT translated to a reduction in healthcare costs of 58% within six months compared to the same timeframe from the period directly prior to commencing HAT.

Conclusion: This exploratory study highlights the potential for innovative harm reduction interventions such as HAT, co-located with primary care services, to improve healthcare access and engagement for a high-risk population. Increased uptake of primary healthcare services translated to reductions in emergency healthcare use and associated costs. Although costs of HAT provision are substantial, the notable cost-savings in health care should be an important consideration in service implementation planning.

Introduction

In the United Kingdom, 5-10% of people who use opioids do not benefit from the standard treatment model, methadone management treatment

[MMT]) (Byford et al., 2013). Heroin Assisted Treatment (HAT), also referred to as Supervised Injectable Opioid Treatment [SIOT] [see (Bell et al., 2018)], is an intervention developed to address this gap in provision. HAT involves prescribing pharmaceutical grade synthetic heroin

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(diamorphine) daily to participants for self-administration under medical supervision. In the UK, the first service-provider initiated HAT service (as opposed to via a clinical trial), ran for three years between Oct 2019 and Nov 2022 in Middlesbrough, North-East England. Despite evaluation findings of positive social and health outcomes for clients (Poulter, 2021; Poulter et al., 2023; Riley et al., 2023), the service was decommissioned in November 2022 due, in part, to concerns about cost-effectiveness.

HAT services have been provided in a variety of forms and durations in Switzerland, Spain, Denmark, Germany, Norway, Canada, Belgium and the Netherlands from 2000. International RCTs have confirmed the efficacy of HAT versus MMT for engaging and retaining high intensity heroin users in treatment, predominantly focusing on a primary outcome of reducing illicit drug use (McNair et al., 2023; Strang et al., 2015). Improvements in physical, mental health and social indicators beyond illicit drug consumption have been shown, but with more inconsistent results (McNair et al., 2023). Within an RCT context, health and social indicators are generally conceptualised as secondary outcomes, with data generated through self-report metrics. One exception is a German-based RCT where health related outcomes were included as a primary measure of success (Reimer et al., 2011). Significant improvements in measures such as cardiac functioning were observed, with no difference in infectious disease markers at 12 month follow up (Reimer et al., 2011). Retrospective cohort studies have been conducted on rates and risk of bloodborne virus (BBV) transmission in Swiss HAT cohorts (Dickson-Spillmann et al., 2016) which highlighted stable rates of HIV clients, increasing vaccination uptake, with reducing rates of HAV and HBV infected clients.

As reported in the RCT literature, there are variable offers of enhanced healthcare services available to clients, alongside the provision of diamorphine. Most trials indicate that an enhanced offer of healthcare comprised psychosocial support and/or case management for clients (Haasen et al., 2009; March et al., 2006; Oviedo-Joekes et al., 2009; Pernerger et al., 1998; Strang et al., 2010). HAT trials in Switzerland, Spain and Canada suggest that additional physical healthcare services were available, although ambiguous terms such as 'somatic primary care' make it difficult to ascertain the exact nature of this offer (March et al., 2006; Oviedo-Joekes et al., 2009; Pernerger et al., 1998). It is not clear from the literature which, if any, services were co-located in the same physical space as HAT treatment provision, which is a feature of the Middlesbrough HAT model.

In the UK, the Randomised Injecting Opiate Treatment Trial [RIOTT] (Strang et al., 2015) produced data pertaining to HAT health outcomes beyond treatment and mortality. Evidence from health econometric analysis of the RIOTT trial suggests a shift in in healthcare access, which translated into savings to the NHS, only when combined with savings to criminal justice sector (Byford et al., 2013). Important differences in healthcare access of the HAT group versus MMT were in reduced engagement with syringe exchange, prescribing, and hospital outpatient care. This suggests altered patterns of health-related behaviours and access to healthcare during HAT, which warrants further exploration given a sharp increase in morbidity and mortality among people who use drugs in the UK over the past decade (ONS, 2022).

Cost-effectiveness studies on HAT trials highlight that savings associated with diamorphine compared to MMT are apparent from the health care sector, but the largest proportion of the cost savings (which impact its overall cost-effectiveness outcomes) are obtained from the criminal justice sector (Bansback et al., 2018; Dijkgraaf et al., 2005; Nosyk et al., 2012). Cost effectiveness studies which analyse healthcare resource use of HAT vs MMT groups in terms of the location of intervention (i.e. inpatient or outpatient care), have found that HAT reduced inpatient care (Bansback et al., 2018; Gutzwiller & Steffen, 2000; Nosyk et al., 2012), use of ambulatory services (Gutzwiller & Steffen, 2000), community psychiatric care use (Haasen, 2009), and can increase the use of some outpatients services (Bansback et al., 2018). However, these studies do not differentiate between unplanned versus planned care, or look at periods prior to trial engagement, or within individual health conditions. Comparison of unplanned vs planned care is an important

lens to analyse healthcare engagement of this group, as previous studies have shown people who inject drugs can exhibit severe healthcare delay, only attending healthcare systems as a last resort with a lack of trust posited as a rationale for this (Harris, 2020). Thus, increases in planned care in this context may act as an indirect measure of increasing trust in healthcare systems. Most of the existing evidence use self-reported data to assess health outcomes, potentially less reliable than data accessed through clinical records (Franklin & Thorn, 2019). Understanding the costs of previous healthcare uptake, including emergency versus planned interventions, can enhance HAT cost-effectiveness analyses.

The unique needs and vulnerabilities of people who use drugs make calculating the cost-effectiveness of specialist drug treatment services such as HAT, particularly complex. HAT in Middlesbrough was a relatively high-cost treatment, involving twice-daily supervised clinic visits and the administration of a high-cost medication. However, Middlesbrough HAT's co-location within an existing primary healthcare service increased opportunities for participants to access healthcare [(Poulter et al., 2023; Riley et al., 2023)]. Changes in participants' engagement with healthcare services may represent cost savings that are under-evidenced. This exploratory study is an initial exercise in evidencing and discussing these impacts.

We draw on analysis of the anonymised health records of HAT participants in Middlesbrough UK, comparing healthcare costs (over and above the cost of HAT) prior to and during HAT engagement, focussing on emergency care visits, wound/SSTI care and unplanned hospitalisations. With healthcare costs associated with opioid use over the past decade increasing by 50% to around £137 million per annum, the impetus for exploring new models of care is strong (Friebel & Maynou, 2022).

Method

Site

The HAT service in Middlesbrough, North-East England, was based in a specialist primary care service for drug and alcohol addiction, operational seven days a week from 8am to 6pm. HAT participants attended twice daily for supervised self-injected doses of diamorphine, in a controlled and clinical environment. This model of HAT is unique to others evaluated in the literature, in that participants could access comprehensive co-located primary care services (e.g. diagnosis, screening and treatment of injury and disease, referrals to secondary care, access to GPs, nurse prescribers, health care assistants dealing with both acute and chronic health conditions [see supplementary material for further information]), alongside their dose of diamorphine due to the co-location of these services (however, accessing additional services was not a mandatory condition of participation in the HAT model).

Recruitment, extraction and analysis process

Between November 2021 and March 2022, one researcher (FR) attended the service and extracted (anonymised) health records for anyone who had engaged with HAT (> 2 months) between October 2019 and March 2022. Another researcher (HP) conducted all coding and analysis, which was quality checked by another researcher (HM) to ensure agreement with coding and costing decisions. Information as to where the health intervention took place, the nature of the intervention and how the healthcare was engaged with was extracted and help guide coding and analysis.

All healthcare interactions (excluding the HAT service costs itself) were coded within the file audit, and here we report on the following primary outcome measures:

- incidents of wound care
- skin and soft tissue infections (minor SSTIs given antibiotics dealt with in the practice and severe infections requiring hospital care)

- overdose (OD) events (those reversed within the practice requiring no further care, and those requiring hospital care and/or required to be reversed in hospital).
- unplanned overnight stays in hospital
- Treatment engagement measures number of appointments which were not engaged with by the participant, wherever the location of that treatment was.
- Hospital treatment engagement measures number of appointments in a hospital setting which were not engaged with by the participant.
- Ambulance Incidents

Secondary outcome measures were a) costs associated with all additional healthcare (excluding HAT service costs itself), b) costs minus incidents of COPD, considering the high cost associated with treating this condition.

The Greater Manchester Combined Authority (GMCA) cost benefit unit database was used as a model for the costing exercise, but to note, we did not follow the GMCA methodology regarding performing a full cost/benefit analysis due to resource and data access constraints ([Greater Manchester Combined Authority \(GMCA\) cost benefit unit cost database., 2019](#)). All healthcare appointments (excluding HAT service cost itself) were assigned an NHS code and cost (see supplementary material). As multiple costs can be associated with one incident e.g. where notes identified an individual had used multiple parts of the healthcare system (i.e. ambulance attended and A&E assessment occurred), details of how the costs for each item were broken down within the GMCA model are included in the supplementary material. A

conservative approach to costing was adopted, i.e. it was assumed all wound care occurring at the GP practice was conducted by a nurse (unless specifically indicated that treated by a GP). Simple descriptive analysis comparing Timepoint A (immediately preceding clients HAT start date) with Timepoint B (the period post start date, engaging with HAT) was undertaken to look at volumes, % changes and associated costs of healthcare incidents (over and above the HAT service costs).

All clients who engaged with Middlesborough HAT during the study period were included in analysis. This comprised 15 participants at three months, and 12 participants at six months (see Table 3 in the supplementary material for sample characteristics). Data from three (n=15) and six (n=12) months either side of starting HAT were included in the analysis (i.e. 3 and 6 months prior to their start date on HAT, and 3 and 6 months of HAT). Sample size changes within each analysis are due to individuals having varied levels of engagement length in the overall sample. Data was trimmed at exactly 3 and/or 6 months to control for engagement length as a confounder. Data were analysed from periods when participants were engaging with HAT, and any periods where individuals were on a break were excluded (this was only a period of approximately 3 months [n=1]); there was one period where an individual was in prison and healthcare records could not be accessed ([n=1]).

Ethics

HRA and HCRW Approval was obtained (IRAS ref: 292909) to conduct the research within an NHS England setting. The main study was a qualitative study funded by the National Institute for Health and

Table 1

Changes in outcome measures associated with healthcare access before and during HAT at 3 and 6 months.

Indicator	3 months analysis (n=15)			6 months analysis (n=12)		
	3 Months Pre-HAT	3 Months of HAT	% change	6 Months Pre-HAT	6 Months of HAT	% change
1. Number of individual health related interactions (total number)	79	91	15%	156	116	-26%
2a. Overall sample Costs (total sum, £) [excluding COPD events (n=1)]	£18,926.34	£10,759.49	-43%	£29,327.02	£11,008.11	-62%
2b. Overall sample costs (total sum, £) [including COPD events (n=1)]	£19976.77	£11,809.92	-41%	£31,427.89	£13,108.98	-58%
3. Treatment Engagement (i.e. number of treatment incidents which were not engaged with) [total number]	28	11	-61%	60	18	-70%
4. Number of apps for dressing of wounds (total number)	23	36	57%	34	47	38%
5. Number of unplanned emergency interactions (total number)	19	10	-47%	28	13	-54%
6. Number of OD incidents requiring emergency care (total number)	7	3	-57%	10	6	-40%
7. Number of OD incidents diverted from emergency care and reversed in HAT service (total number)	0	2	200%	0	3	300%
8. Number of severe SSTI incidents requiring hospital care (total number)	4	0	-100%	8	0	-100%
9. Number of incidents of SSTI dealt with in service and given preventative treatment (total number)	2	7	250%	3	12	300%
10. Number of unplanned overnight stays in hospital (total number)	18	1	-94%	19	1	-95%
11. Hospital treatment Engagement (i.e. number of treatment incidents which were not engaged with) [total number]	3	4	33%	3	4	33%
12. Ambulance Incidents	11	6	-45%	12	9	-25%

Narrative

1. The number of individual health related interactions both increased (at 3 months) and decreased (at 6 months).
2. The associated costs with all health-related interactions (over and above treatment costs) reduced substantially (43%) with greater reductions observed the longer someone engages with HAT (e.g. here at 6 months, 62%)
3. Individuals engaging with HAT appeared to be less likely to not engage with treatment for their health, with greater reductions observed at 6 months.
4. An increase in engagement with wound care as a preventative treatment at 3 and 6 months was observed, with more preventative wound care ongoing within the first three months of HAT. It is likely this would translate to reduction of SSTIs over time (alongside the provision of clean medication and equipment).
5. Unplanned emergency interactions (ambulance call outs, attendance at Accident & Emergency) reduced substantially at both timepoints, reducing the burden on emergency healthcare systems.
6. There was a reduction of OD incidents requiring hospital care (or an ambulance attendance) at both timepoints. Previous evidence suggests (Reimer et al, 2011) that non-fatal OD incidents are more likely within HAT, but are reversed successfully. This was also within a context of some participants struggling with illicit street tablet usage, which can also lead to increased OD incidents.
7. A small but consistent number of OD incidents were reversed within the service with oxygen and monitoring from staff at both 3 and 6 months, reducing the burden on the emergency healthcare systems.
8. There was a reduction in severe SSTIs requiring hospital care at 3 months and 6 months, with a higher number of incidents prevented at 6 months. Although these are very small numbers, it is likely the cumulative effect of increased wound care, clean medication and equipment overtime would likely result in higher numbers of SSTIs averted.
9. There was an increase in SSTIs treated within the service and given preventative treatment (i.e. microscopy and antibiotics) at both 3 and 6 months.
10. Unplanned overnight stays in hospital were substantially reduced at both timepoints (3 and 6 months). All incidents of unplanned overnight stays were related to wound issues, serious SSTI (abscess), OD. One incident related to a dislocated hand but it is unclear the cause of this.
11. Hospital Treatment Engagement reduced slightly at both timepoints (i.e. there were a higher number of treatment incidents which were not engaged with at both 3 and 6 months). This could suggest that generic emergency healthcare systems may still be perceived with mistrust by this group.
12. Ambulance incidents were reduced at both timepoints.

Care Research [Applied Research Collaboration North-East and North Cumbria (NIHR200173)] and these additional datasets were collected with funder and ethical permission.

Results

Our findings indicate a shift in healthcare utilisation while engaging with the HAT service. At both follow-up time points interactions at the practice and hospital level for specific types of healthcare utilisations changed, and this appeared to both directly and indirectly reduce burden on emergency healthcare systems. Changes in healthcare utilisation during HAT translated to a reduction in healthcare costs of 58% within six months.

Direct mechanisms in which burden on the healthcare system were reduced, included increased capacity to address ODs within the HAT service using oxygen, naloxone and staff monitoring. This resulted in an increased number of ODs being diverted from hospital and reversed successfully in the practice at both three and six months. There was a reduction of healthcare interactions for ODs at hospital level and a reduction of unplanned overnight stays for serious SSTIs requiring hospital care, both leading to reductions in emergency presentations. An increase in engagements for preventative wound care, and treatment for SSTIs within the HAT service were evidenced, which can also impact long term health care costs, including inpatient admissions. Treatment engagement improved (i.e. the number of appointments which were not engaged with decreased) however treatment engagement within hospital settings increased. Access to healthcare appeared to be enabled by the co-location of HAT within a primary care facility, improving primary healthcare provision to a group of marginalised individuals at high-risk of mortality and morbidity.

Discussion

Prior to HAT engagement, participants typically experienced poor health outcomes related to injecting illicit heroin and exhibited low preventative healthcare engagement. This placed a high demand on emergency healthcare systems, exemplified by incidences of unplanned hospitalisation, ambulance incidents, overdose and SSTIs prior to recruitment onto HAT. During the time they accessed HAT, participants appeared to transition from reactive model of healthcare access, to a more consistent preventative engagement with healthcare services. For example, increased engagement with wound care (alongside the provision of clean equipment and medication), appeared to reduce pressure placed onto emergency healthcare systems, evidenced by a reduced volume of serious SSTIs requiring hospital care, ambulance incidents and a reduction of unplanned overnight hospital stays. These reduced hospitalisations and increased use of some community services correlates with existing evidence from health economic assessments (e.g. (Bansback et al., 2018), furthering our understanding of how HAT may alter the model of healthcare access for this population, and in which conditions these impacts are realised.

These findings support the perceptions of HAT healthcare providers, who noted that client engagement with the co-located health service facilitated earlier symptom detection and referral to care (Poulter et al., 2023). As we elaborate in a linked publication (Poulter et al., 2023) provision of daily diamorphine provided benefits beyond access to 'free heroin', allowing trust and connection to be forged with staff. This in turn improved engagement with preventative physical healthcare. These findings align with related literature highlighting the importance of strong "healthcare-provider relationships in patient-centred care" alongside the availability of injectable opioid agonist treatment for engaging the most marginalised (Marchand et al., 2020).

Implications for UK health delivery

While this was a crude conservative analysis of a small sample there

is potential learning for UK health delivery and policy. The co-location of HAT within a primary care service seemed to facilitate healthcare seeking and promote proactive healthcare engagement in participants (Poulter et al., 2023). The Office for Health Disparities (formerly Public Health England) have called specifically for the embedding of healthcare services in existing treatment services, recognising developing models of care which facilitate prevention is a fundamental component of the NHS long term plan in the UK (Public Health England, 2018). Our findings provide evidence for the potential of co-locating primary healthcare and drug treatment services in improving access and promoting preventative healthcare for people who use drugs.

Alongside implications for service design and delivery, this study highlights issues with producing accurate cost-effectiveness analyses for treatments designed for complex and vulnerable populations. The Middlesbrough HAT service closed after two years in operation due to withdrawal of funding. Cost-effectiveness, given the small number of places available for clients, appeared to be a driving concern. These concerns were perhaps premature given that locally generated evidence for cost-effectiveness had not been commissioned, beyond a small analysis of criminal behaviour [see (Poulter et al., 2021)] which did not assess any healthcare related costs. Evidence from the RIOTT study indicated that standard HAT treatment, even without co-location within primary care, is cost effective (Byford et al., 2013). The analysis presented here suggests potential additional economic benefits related to the co-location of HAT within primary care services. While these savings require more rigorous exploration over a longer duration, we suggest that co-location in primary care can produce healthcare savings that may further enhance the cost-effectiveness of the UK HAT model, derived from RIOTT. Adaptations of the HAT model to realise additional cost savings could and should be explored in the UK. This could include exploration of the use of hydromorphone (a cheaper product with similar therapeutic effects used in the NIAOMI trial in Canada, see Bansback et al., 2018), or generating a UK supply of diamorphine to avoid reliance on international supplies which are expensive to buy and import to the UK (Poulter et al., 2022).

A limitation of this study is the small sample size limiting analysis to descriptive statistics, however this was the full population of individuals who had engaged in the intervention in HAT the time of data extraction. There were gaps in the data due to barriers to accessing health data for any periods of incarceration, due to not having access to prison data systems which would record health interactions (n=1). This small exploratory study is not intended to be a comprehensive cost/ benefit analysis, but a comparative analysis of additional healthcare costs before and during HAT engagement. Thus, our analysis does not include HAT service costs or costs and benefits relating to criminal behaviour, which are important further avenues of further research. It is crucial that ongoing research in this area with a larger sample size is conducted to develop our knowledge about how HAT services work in practice outside of RCT conditions.

Availability of data and materials

The dataset(s) supporting the conclusions of this article is(are) not included, given the small sample size and population specificity could enable deductive disclosure.

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CRediT authorship contribution statement

Hannah L. Poulter: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Helen J. Moore:** Writing – review &

editing, Supervision, Project administration, Formal analysis, Conceptualization. **Danny Ahmed:** Writing – review & editing, Conceptualization. **Fleur Riley:** Writing – review & editing, Data curation. **Tammi Walker:** Project administration. **Magdalena Harris:** Writing – review & editing, Supervision, Formal analysis, Conceptualization.

Declaration of competing interest

Danny Ahmed works as clinical lead for Foundations Medical Practice which delivered HAT in Middlesbrough. Danny Ahmed was not part of the evaluation project data collection or analysis, but supported data access.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.drugpo.2024.104367](https://doi.org/10.1016/j.drugpo.2024.104367).

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