Access to physician-based Helicopter Emergency Medical Services in the UK: a service analysis in 2024

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ABSTRACT

Background Physician-based prehospital teams provide advanced critical care services in the UK (eg, prehospital anaesthesia). The last review of such teams in 2009, which included England, Wales and Northern Ireland, reported only one physician-based prehospital team available 24/7. Helicopter Emergency Medical Services (HEMS) across the UK offer paid physician-based teams, while other organisations may provide physician-based teams on a voluntary ad hoc basis. The primary aim of this study was to determine if access to a physician-based HEMS team has changed in the past 12 years.

Methods An online survey was distributed to all UK HEMS organisations in January 2024. The primary outcome measure was the number of physician-based teams operated by HEMS in 2024 and the operational hours of such teams. Secondary outcomes included interventions offered by HEMS teams and any additional medical teams offered (eg, paramedic only).

Results All 21 HEMS responded. The number of potentially available physician-based HEMS teams has increased from 11 in England, Wales and Northern Ireland in 2009 to 28 in 2024, with two services in Scotland (total=30). HEMS providing consistent 24/7 physician-based prehospital teams increased from one (5.9%) in 2009 to 11 (52.4%) in 2024. The East of England has the highest 24/7 availability, with Northern Ireland, South West England and Northern England the least. Within physician-based teams, variation remains in advanced interventions available—for example, 19 services (90.4%) offer blood transfusion while only one (4.7%) offers resuscitative balloon occlusion of the aorta. Only one service is completely government funded; the others are funded by charity alone or a combination of charity and government sources.

Conclusion Both geographical and temporal variations in access to a physician-based HEMS remain across the UK, although there has been improvement since 2009. However, within this provision, variation exists in terms of interventions provided such as the provision of blood products.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ A study in 2009 showed significant variation in geographical and temporal availability of a physician-based HEMS team.
⇒ A 2020 study review of the ability to provide prehospital anaesthesia within the 45 min recommended by the NICE guideline continued to show the same geographical and temporal variation.

WHAT THIS STUDY ADDS

⇒ There has been an increase in the number of physician-based HEMS teams compared with 2009 but significant variation remains; the East of England has the highest 24/7 availability, with Northern Ireland, South West England and Northern England having the least.
⇒ Variation also exists in interventions, standard operating procedures and dispatch methods.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Additional research into other prehospital providers is required and wider healthcare policies may be required to improve access as there is heavy reliance on the charitable sector.

INTRODUCTION

Prehospital critical care encompasses the advanced interventions offered to patients prior to reaching hospital, such as prehospital anaesthesia (PHEA) or resuscitative thoracotomy. In the UK, only physician-based prehospital teams can deliver these types of interventions, also called Level 3 interventions. One recent UK study found improved survival for patients treated by physician-based teams, when the severity of their illness or injury was considered.[1] It is therefore important to understand what access patients have to such care across the UK.

In the UK there are both paid physician-based teams within Helicopter Emergency Medical Services (HEMS) as well as voluntary physician-based teams such as the British Association for Immediate Care (BASICS). However, the provision of services by voluntary services varies depending on the skillset volunteering day-to-day.[2] Thus, to determine the consistent availability of Level 3 prehospital interventions it is necessary to evaluate the availability of physician-based teams within HEMS. HEMS teams are typically dispatched via NHS ambulance services to the most unwell medical and trauma patients, either by helicopter or Rapid Response Vehicle. However, funding models for HEMS are mostly charitable, so it is reasonable to expect some ongoing variation between services.[3]

The last survey that described the access of UK patients to physician-based prehospital teams was performed in 2009.[4] At that time there were 17 HEMS teams (also known as air ambulances) operating in England, Wales and Northern Ireland, but only 11 included a physician (65%) and four (23%) consistently operated a physician-based team 7 days

a week.[4] Only the London Ambulance Service had access to a 24/7 physician-based prehospital team.[4] Indeed, many services had unpredictable cover, with 76% relying on volunteer staffing to some degree.[4] A 2018 analysis of the ability to provide PHEA also showed marked geo-temporal variation.[2]

Since the 2009 analysis of physician-based critical care teams much has changed, including the development of both formal prehospital emergency medicine training for physicians and Major Trauma Networks.[2] The primary aim of this study was therefore to determine if provision of physician-based HEMS teams, and therefore the associated Level 3 interventions, has changed in the past 12 years across the UK. The secondary aims were to assess if variations in provision of interventions within the scope of a Level 3 team existed between services and to attempt to establish what other critical care services existed.

METHODS

Study design

An online survey was conducted across all existing UK HEMS. The survey was developed in 2023 and distributed over a 9-week period between 4 January 2024 and 18 March 2024. The Checklist for Reporting the Results of Internet E-Surveys was used for reporting this study.[5]

Participants

The survey was shared via email to medical and operational directors of all UK HEMS services, alongside a participant information sheet. Only recipients of the email, or colleagues they chose to share it with, were able to complete the questionnaire. If no reply was recorded, reminders were sent after 1 month.

For a team to qualify as a physician-based HEMS team, a physician had to be present on >95% of shifts. If this was not the case, the HEMS team was still included in the results but was not represented as being able to provide Level 3 care, including PHEA.

Survey tool

The survey was developed by first author SMa based on an initial literature search, including review of the 2009 paper, as part of a university project.[4] The preliminary version was then reviewed and edited by author SMo prior to the survey being piloted on colleagues of SMa to establish the timings and ease of the survey. Final adjustments were then performed prior to use. The survey requested descriptive data relating to the service, including the area of operation and the funding model, team make-up, hours of operation, dispatch models and night coverage, services offered and provision of BASICS services in the HEMS region. To allow comparison of temporal data between regions, respondents were asked to report on services available on a Tuesday (weekday) at both 03:00 hours and 15:00 hours and a Saturday (weekend) at both 03:00 hours and 15:00 hours. The survey is shown in online supplemental appendix 1.

Data collection

Only one response was possible per respondent. If there were multiple responses for a HEMS service, the data were checked to ensure there were no discrepancies between respondents and clarifications were made via email if necessary. No incentives were offered for participation. All survey responses were stored securely on an encrypted electronic database and entered manually into Microsoft Excel to analyse. If clarification was required, this was sought via email to the survey responder.

Analyses

The primary outcomes were the number of physician-based teams operated by each HEMS service in 2024, teams per population density and the operational hours of such teams. Secondary outcomes included the interventions offered by the physician teams and other services available.

Population density was used as the best available proxy for clinical need to allow comparison between the number of physician-based HEMS teams and the population in a particular UK region.[6] Population density was calculated using data from the Office for National Statistics (ONS) and equivalents in devolved nations (Scotland, Wales and Northern Ireland).[7–10] Each HEMS service was assigned to an ONS region. One service (Great North Air Ambulance) had a separate team and base in two regions. The Air Ambulance Service had one team that

Table 1 Maximum number of HEMS teams and physician-based teams available by region

Region	No of HEMS teams	Maximum no of HEMS teams available (any combination of clinician)	No of physician-based (Level 3) teams available Tuesday weekday daytime hours	No of physician-based (Level 3) teams available Saturday weekend daytime hours	No of physician-based (Level 3) teams available Tuesday weekday nights (throughout hours of 22:00–07:00)	No of physician-based (Level 3) teams available Saturday weekend nights (throughout hours of 22:00–07:00)
North East	1	1	1	1	1	1
North West	2	4	2	2	0	1
Yorkshire and Humber	1	2	1	1	0	0
East Midlands	2	3	2	2	2	3
West Midlands	2	4	3	3	1	1
East of England	3	5	5	5	4	4
London	1	2	2	2	1	1
South East	3	4	4	4	1	1
South West	5	6	4	4	0	0
Scotland	1	4	2	2	2*	2*
Wales	1	4	2	2	1	1
Northern Ireland	1	1	1	1	0	0
TOTAL	**21†**	**40**	**29**	**29**	**11**	**13**

*Teams only available for specific taskings.
†Accounts for two services with teams in two regions.
HEMS, Helicopter Emergency Medical Services.

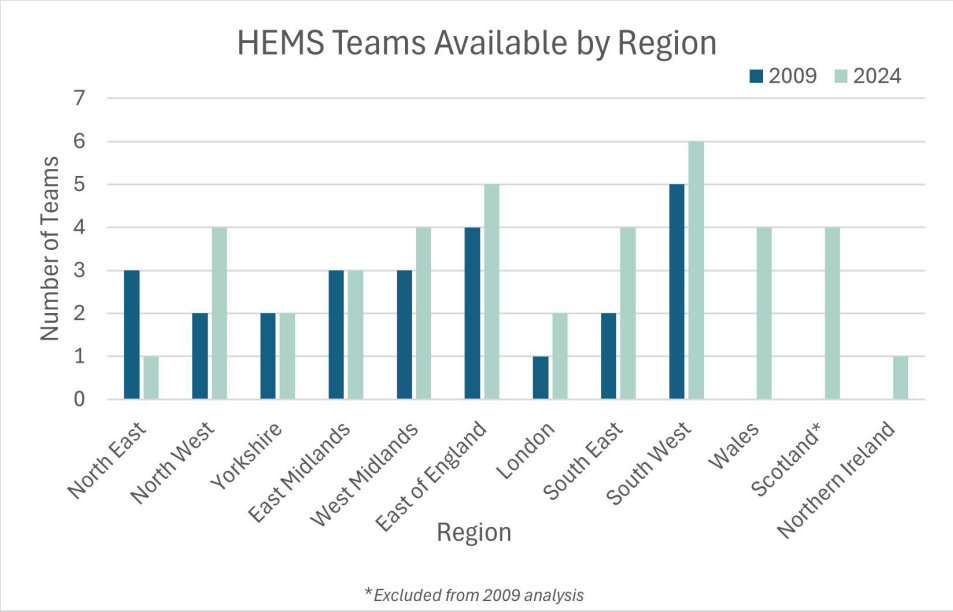

Figure 1 Availability of Helicopter Emergency Medical Services (HEMS) by region between 2009 and 2024.

covered areas within two regions, so was assigned to the region with the larger population (East Midlands).

Patient and public involvement

There was no patient or public involvement in the development of the survey.

RESULTS

At the time of writing there are 21 UK HEMS teams, all of which responded see online supplemental file 2. The number of potentially available physician-based HEMS teams increased from 11 in 2009 to 28 in 2024, excluding Scotland (30 including Scotland; see table 1 and figure 1).[4]

Access to a HEMS team overnight

Eleven of the 21 services (52.4%) provided a physician-based prehospital critical care team 24/7, an increase from only one out of 17 services (5.9%) in 2009 (table 1).[4] There was regional variation in operational times. In two regions every service had a 24/7 team, whereas four regions did not have 24/7 cover. Times that services went offline varied, with some services finishing at 19:00 or 19:30 hours, compared with others that went offline at 02:00 and 03:00 hours. These variations can be seen in figure 2. A few services had extended hours over the weekend, with one service operational until 02:00 hours on Friday and Saturday, when it otherwise went offline at 20:00 hours. Two services also had additional teams at specific days of the week, such as over the weekend. All services that operated overnight had teams present on base, except for the two in Scotland where the teams were on-call from home after 18:00 and 23:00 hours, respectively. Twelve of the 21 services (57.1%) used a helicopter in darkness, with 11 (52.45%) potentially able to fly overnight if within weather limits. The remaining services responded only by Rapid Response Vehicle in darkness.

Population, area and access to a HEMS team

Nationally, there was a mean of 0.63 HEMS teams per million of population. This varied significantly between regions, from 0.81/million in the East of England to 0.23/million in London. The ratio of teams to area also varied. Per 10 000 km^2, London had 12.70 teams whereas the North East had 1.17 and Scotland had 0.64. Figure 3 shows a comparison between team availability (including physician-based teams) and population density.

Interventions

Services reported that crew make-up had an impact on which interventions a team could provide. Physician presence was required for Level 3 interventions such as prehospital emergency anaesthesia and resuscitative thoracotomies.

Every physician-based HEMS team provided IV sedation, thoracostomies, surgical airways, PHEA, amputations, resuscitative thoracotomies and resuscitative hysterotomies, consistent with Level 3 interventions. The other technical skills available to patients from physician-based HEMS teams across the country are summarised in table 2; non-technical interventions such as decision making were not included. Three services reported trials or collaborations regarding extracorporeal membrane oxygenation or similar endovascular resuscitation techniques during cardiac arrest just being started or due to commence in the near future.

Taskings

All services attended trauma and medical patients; however, one service attended medical patients only through crew request (London Air Ambulance) due to the nature of their dispatch pathway. Nine services (42.8%) also carried out secondary retrievals and critical care transfer.

Eleven services were dispatched by a HEMS paramedic working on the dispatch desk, with nine dispatched by a HEMS-specific non-clinical dispatcher and one by any non-clinical dispatcher.

Funding

Twelve of the 21 services reported being completely charity funded, with eight services reporting combined government/charity funding. The breakdown of this split was not recorded. Only one service was fully government funded. In the devolved nations every service was either completely or partially

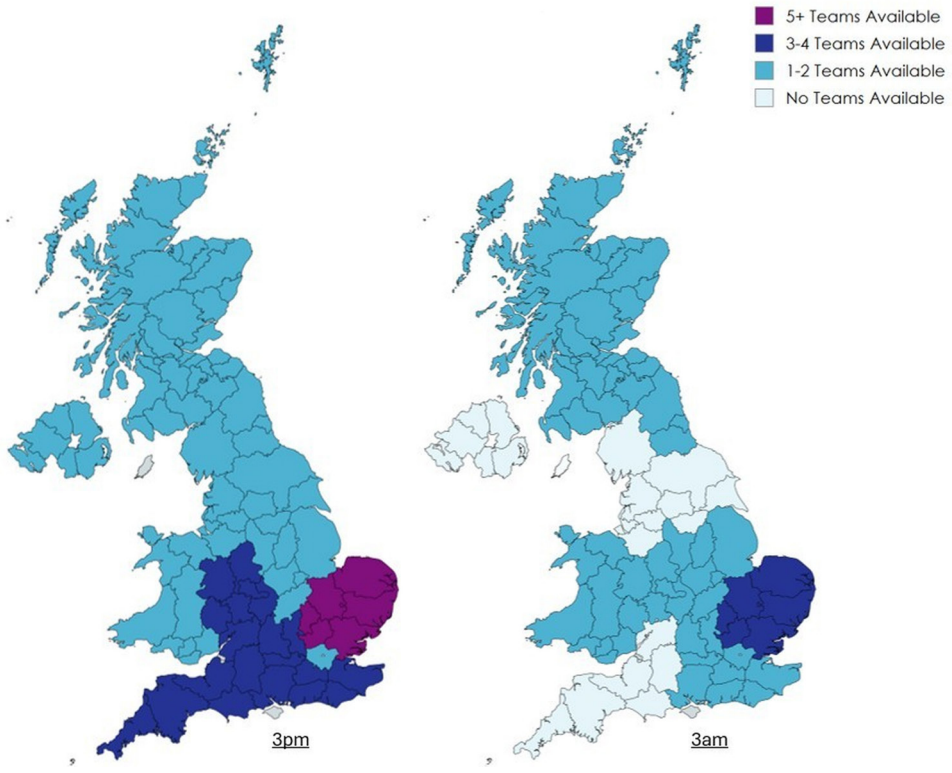

Figure 2 Availability of physician-HEMS teams across the UK on a Tuesday.

government funded, whereas in England six out of 19 services received partial government funding and none were fully funded.

Additional prehospital critical care assets

All regions reported additional prehospital critical care assets in the survey. In addition to the physician-based HEMS teams, there was potential for another 10 HEMS teams to be available, but only operating at Level 2 interventions as they were not physician-based (figure 2). Several regions mentioned Advanced or Critical Care Paramedics as additional critical care resources, providing Level 2 interventions—for example, the London Ambulance Service Advanced Paramedic Programme in London. Some HEMS services also provided solo-response ground-based critical care practitioners providing Level 2 interventions for the region in which they operated.

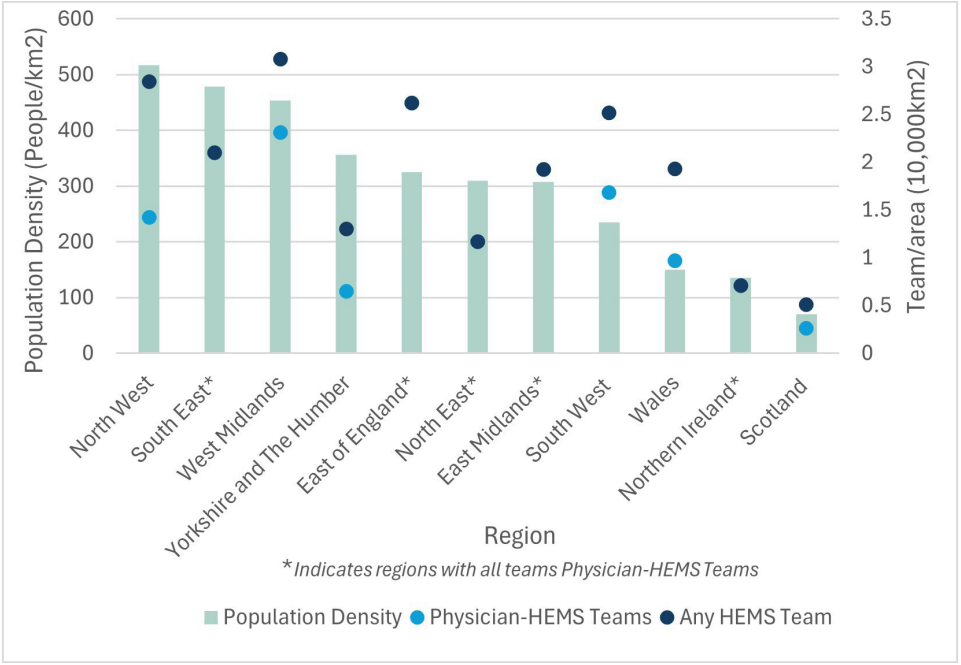

Figure 3 Availability of Helicopter Emergency Medical Services (HEMS) teams compared with regional population density (London excluded).

Table 2 Potential advanced prehospital (Level 3) interventions available

Intervention	No of services offering intervention
Blood transfusion (red blood cells, fresh frozen plasma or whole blood)	19
Regional anaesthesia	17
Arterial line	16
Lateral canthotomy	16 (1 service dependent on individual clinician skill)
Dried plasma (or alternative)	8
Resuscitative balloon occlusion of aorta (REBOA) for trauma	1

BASICS schemes were reported as being active in 11 regions. These teams provided either Level 2 or Level 3 prehospital care on a voluntary basis.

Scotland has two emergency department-based prehospital critical care teams and the South West has one, in addition to their HEMS teams. These teams can be activated by the ambulance service to attend major trauma patients at the roadside. The West Midlands also has the Medical Emergency Response Intervention Team (MERIT), a critical care car run by the West Midlands Ambulance Service.

DISCUSSION

There has been an increase in the number and distribution of physician-based HEMS teams in the UK since 2009, but there continues to be geographical and diurnal variability. From 11 physician-based HEMS teams in 2009 there are now 30.[4] While it is encouraging to see this improvement in access, the ability to provide 24/7 access to Level 3 interventions such as PHEA remains variable across the country, with heavy reliance on the charitable sector. As in 2009, charitable funding remains the main source for HEMS in the UK.

Temporal variation in the need for a HEMS team is likely unique to each region and requires individual service analysis. A higher rate of significant trauma has been seen nationally between 18:00 to 00:00 hours compared with 06:00 to 12:00 hours.[11] Overnight availability has increased from a maximum of one team in 2009 to nine teams in 2018 and to 14 in this study.[2 4] However, with three regions without 24-hour provision, it is unclear by how much the NICE standard of PHEA within 45 min of an emergency call will have improved from 10% of the population having access overnight to a timely PHEA in 2018.[2]

The impact on overall survival of not having a HEMS team 24/7 across the UK is hard to assess. However, one large UK-based cohort study on HEMS survival showed an improved survival for patients attended by physicians on scene.[1] Another recent meta-analysis showed that the presence of a HEMS team resulted in a statistically significant survival benefit in patients with an injury severity score >8 compared with traditional emergency service responses.[12] It was recognised that the HEMS team configuration was not always comparable in the studies included, but the benefit remained irrespective of this.[12] A mortality benefit has even been shown for patients who are seen by a physician on-scene but then receive onward transport to hospital by the ambulance service (and not the HEMS team), suggesting that physician-based HEMS teams provide senior decision making.[1] The benefit of out-of-hospital cardiac arrest care is less clear but trends towards benefit.[13] A greater appreciation of the benefit (or lack) of HEMS may be required to influence healthcare policy moving forward.

It is of note that London appears to have fewer teams per population density. However, this is due to the smaller geographical area covered by London HEMS despite the large population of London. Additionally, London has four major trauma centres whereas many areas of the UK have one shared over a region, likely creating easier access to a major trauma centre for the ambulance service in a timely manner.

The variation in interventions offered by the HEMS team seen in this study is something that has not previously been documented collectively. Recent studies have shown variation in practice, such as 11 different recommendations for when to give calcium in blood transfusions from 25 different UK services.[14] Similar variations have been seen with resuscitative thoracotomies, with a review of nine UK HEMS Standard Operating Procedures finding nine different recommendations,[15] despite standard guidelines from the Faculty of Prehospital Care.[16] In Scotland, a consensus writing process involving prehospital critical care teams and the Scottish Ambulance Service ensures that the same Standard Operating Procedure can be used by different teams.[17] This method could be applied in other regions as it ensures recommendations are relevant to all stakeholders.

Similarly, several 'rare skills' were recorded in this survey—for example, resuscitative balloon occlusion of the aorta for trauma was only reported by one service. However, the significant differences in demographics across the UK mean that it is not necessarily inequitable for different populations to have access to different interventions, but does require consideration.

However, it is also appreciated that, even when a service can offer the same Level 3 intervention as another, there are likely to be other factors that affect patient outcomes such as the geography and demographics of a region covered by the HEMS team. London HEMS covers a catchment area that allows them to reach patients rapidly; it may be that this is a contributing factor to the improved survival rates London HEMS have historically demonstrated for resuscitative thoracotomies (18% of patients in a narrowly defined patient group) compared with a review from a more rural service in the East of England which identified no survivors to discharge.[18 19] Indeed, a recent Norwegian study showed clearly that prehospital time intervals increase significantly from urban to remote areas.[20] There are some geographical barriers that, regardless of team provision availability, HEMS alone may not yet be able to overcome.

A variety of dispatch methods were described in this study. Although used by many services, HEMS paramedic dispatch has been seen to be non-superior to HEMS-specific non-clinical dispatchers. One study showed that non-clinical dispatchers identified more patients requiring critical care interventions, with a study from the East of England finding no difference in the use of these interventions between non-clinical dispatchers and HEMS paramedics.[21 22] However, it is recognised that HEMS paramedics are a finite resource and services should reflect on their use; more research into this area is needed.

This study was limited by not examining BASICS or Level 2 prehospital critical care teams such as Advanced Paramedics in Critical Care. Although no recent work has been undertaken examining the activity and capabilities of these teams, historically 16 BASICS schemes in the UK were identified as able to deliver PHEA.[23] It is, however, unknown where or when these teams practised and requires further research. It is appreciated that to establish the exact provision of prehospital critical care, teams beyond that of HEMS are also considered. For example, London has one HEMS service and a maximum of two physician-based teams available. However, there is an established model where HEMS predominately attend trauma and Advanced Paramedic

Practitioners routinely attend cardiac arrests which, in other parts of the country, HEMS teams may otherwise attend.[24] Whilst unable to perform PHEA, an Advanced Paramedic Practitioner can provide Level 2 skills such as non-drug assisted intubation during cardiac arrest and cardiac ultrasound before accompanying the patient to hospital. Potentially, a Level 3 team would only be needed if a return of spontaneous circulation occurred and PHEA was required.

Methods to increase HEMS accessibility have successfully worked in other nations. Norway introduced a requirement for 90% of the population to be reachable by a HEMS team within 45 min of the initial call.[25] This has been achieved with revision of base locations and utilisation of other resources such as the Coastguard. However, using response standards such as this may actually increase problems by neglecting those who have the most barriers to care—the population that lives outside the 45 min time may already be further away from a hospital. It is also important to reflect on the quality of care that is then received by the population; teams must be sufficiently trained and skilled to respond appropriately to the demands placed on them.

We believe a whole-view analysis of HEMS and also BASICS schemes, emergency department-based prehospital teams, advanced paramedics and other resources must be undertaken to accurately reflect the current landscape based on the provision of interventions that are known to change outcomes. Determining and then addressing the disparities found would require significant collaboration and interdisciplinary working, with additional funding likely to be needed. However, this process is integral to ensure that services can continue to develop and meet the needs of the patients they exist to serve.

Limitations

Although respondents named additional prehospital teams within their region, it was impossible to determine the access to these teams. This means that overall access to prehospital critical care cannot be determined.

Also, it was assumed in this study that there is a benefit to the patients of timely HEMS team management with, for example, interventions such as PHEA. For some patients, however, it may be argued that they receive greater benefit from rapid transport to hospital than prehospital management.[26 27] The role of HEMS teams in response to major incidents was also not considered, although there are recommendations for these teams to be a key part of such responses.

Finally, the data from this survey are current only to March 2024, and provision will likely change in the future as services develop and funding changes. Several respondents noted plans to expand their provision in the near future. This suggests that this survey should be repeated regularly to gain an understanding of service developments while looking to see if these promote equity of access.

CONCLUSION

Variations in access to a physician-based HEMS remain both geographical and diurnally across the UK, although there has been an improvement since 2009 with 11 physician-based teams available 24/7 compared with only one in 2009. However, even within this provision, variation exists in terms of interventions provided such as the provision of blood products or regional anaesthesia.

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