**SCHEDULE 2 – THE SERVICES**

1. **Service Specifications**

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| 1. **Service name**
 | Hyperbaric Oxygen Therapy Services (All Ages) |
| 1. **Service specification number**
 | 170084S |
| 1. **Date published**
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| 1. **Accountable Commissioner**
 | NHS England [Trauma Programme of Care](https://www.england.nhs.uk/commissioning/spec-services/npc-crg/group-d/)(Retained National Specialised Service) |

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| **5.** | **Population and/or geography to be served** |
| **5.1** | **Population Covered**The service outlined in this specification is for patients ordinarily resident in England or otherwise the commissioning responsibility of NHS England (as defined in the [Manual of Prescribed Specialised Services).](https://www.england.nhs.uk/publication/manual-for-prescribed-specialised-services/) This is an all-age service specification.  |
| **5.2** | **Minimum population size**The service is provided to patients for two specific indications in line with [current clinical commissioning policy](file:///C%3A/Users/AnnaVogiatzis/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/249U2QJZ/NHS%20England)**Decompression Illness**Decompression illness arises from exposure to an altered pressure environment, most often from diving. The geographical distribution of cases of decompression illness is determined by the local level of diving activity, and is concentrated around coastal areas, inland expanses of water and the locations of residence of the divers. Airports provide a significant minority of patients usually returning from a diving trip overseas. There is a total of approximately 150 - 200 cases in England per year. **Gas embolism**Cases of gas embolism arise from introduction of gas into a patient’s circulation, most often inadvertently during a medical procedure (iatrogenic gas embolism).There are currently approximately 10 cases in England per year. However, this may be an underestimate of the number of actual cases. Hyperbaric Oxygen Therapy is not routinely commissioned for other indications including:* Carbon Monoxide Poisoning
* [Necrotising soft tissue infections](https://www.england.nhs.uk/wp-content/uploads/2018/07/hbot-for-necrotising-soft-tissue-infections-v2.pdf)
* [Soft tissue radiation damage in patient with a history pelvic irradiation](https://www.england.nhs.uk/wp-content/uploads/2018/07/hbot-for-soft-tissue-radiation-damage-v2.pdf)
* [Diabetic lower limb ulceration (diabetic foot ulcer)](https://www.england.nhs.uk/publication/hyperbaric-oxygen-therapy-for-diabetic-lower-limb-ulceration-diabetic-foot-ulcer-all-ages/)
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| **6.** | **Service aims and outcomes** |
| **6.1** | **Service aims**The aim of the service is to deliver Hyperbaric Oxygen Therapy (HBOT) for those suffering from Decompression Illness (DCI) or Gas Embolism. **The above aim will be achieved by:** * Providing specialist 24-hour a day, 7 days a week access to clinical assessment by a hyperbaric physician for patients who have symptoms following diving or exposure to altered pressure environment, or who may have had gas enter their circulation by another mechanism.
* Where appropriate, onward referral or discharge of patients who do not require HBOT.
* 24-hour access to emergency HBOT for appropriate medical conditions
* HBOT delivered in facilities that are well maintained, comply with all relevant regulations, and follow best practice.
* HBOT facilities are staffed with suitably qualified, experienced teams with skills that are actively maintained and appropriate to the patient groups the provider is commissioned to treat.
* The delivery of care that is integrated with care from other sources including the Emergency Department, Critical Care, and other healthcare professionals.
* Wherever possible, supporting the return of the service user to their pre-injury level of function, including referral to return to diving assessment if appropriate.
* Engaging in relevant research and development and actively engage in national audit and data collection.
* Working with relevant agencies and clinicians to support education and prevention initiatives.
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| **6.2** | **Outcomes**NHS Outcomes Framework Domains & Indicators

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| Domain 1 | Preventing people from dying prematurely |
| Domain 2 | Enhancing quality of life for people with long-term conditions |
| Domain 3 | Helping people to recover from episodes of ill-health or following injury |
| Domain 4 | Ensuring people have a positive experience of care |
| Domain 5 | Treating and caring for people in safe environment and protecting them from avoidable harm |

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| **No** | **Indicator** | **Data source** | **Domain** |
|  | Decompression Sickness: Mean EQ5D Usual Activities Score at 30 day follow up | The Hyperbaric Oxygen Treatment Registry (Redcap) | 1, 3  |
|  | Gas Embolism: 30-day survival | The Hyperbaric Oxygen Treatment Registry (Redcap) | 1, 3, 5 |
|  | Decompression Sickness and Gas Embolism: % of patients experiencing a complication of HBOT | The Hyperbaric Oxygen Treatment Registry (Redcap) | 4, 5 |

Detailed definitions of indicators, setting out how they will be measured, are included in schedule 6A Reporting Requirements – Local Requirements Reported Locally - of the NHS Standard Contract (Specialised Commissioning template). See section regarding the [Specialised Quality Services Dashboards](https://www.england.nhs.uk/commissioning/spec-services/npc-crg/spec-dashboards/) (SSQD).Commissioned providers are required to participate in annual quality assurance and collect and submit data to support the assessment of compliance with the service specification as set out in Schedule 4A-C. The service will engage in audit and monitoring of the service as agreed by NHS England.  |
| **7.** | **Service description** |
| **7.1** | **Service model**NHS England commissions a small number of geographically dispersed Hyperbaric Oxygen Therapy (HBOT) providers across England. For this service, HBOT is defined as delivery of medical grade oxygen (>99.0 % purity) inside a treatment chamber at a pressure not less than 2 ATA (Atmosphere Absolute). All providers must have the capability to provide hyperbaric critical care in line with the Cox Report category 1.Cox Report categories: * **Category 1:** facilities should be capable of receiving patients in any diagnostic category who may require Advanced Life Support either immediately or during Hyperbaric Oxygen Therapy (HBOT).

The hours of operation are 24 hours a day, 7 days a week. There must always be a named on-call team available. If the provider is unable to provide treatment, then mutual aid arrangements previously agreed with the commissioner must be in place for patients to be referred to an appropriate alternative commissioned provider. In the event of the provider being unexpectedly unable to provide treatment it is the responsibility of the Hyperbaric Physician to refer to an appropriate alternative NHS commissioned provider. However, it is the alternative Hyperbaric provider who is responsible for triaging and accepting the patient for treatment. Each member of chamber staff must maintain competency through completing and recording at least 10 patient treatments, simulations, or other relevant training sessions per year. Services providing HBOT must comply with the latest guidance as set out in section7.8: Applicable National / International Standards Providers must be:* registered with Care Quality Commission (CQC).
* appraised by the British Hyperbaric Association (BHA) every 5 years or appraised to these standards by an appropriate alternative organisation as agreed by the commissioner.
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| **7.2** | **Pathways**Overall patient pathway Patients may be referred to a provider by:* self-referring
* Emergency department
* a healthcare professional in an NHS setting for cases presenting outside of the Emergency Department (e.g. Critical Care)
* a diving supervisor in the case of occupational diving
* HM Coastguard

All referrals must be discussed and agreed with a Hyperbaric Physician at the receiving provider before the patient is accepted for hyperbaric treatment. Transfer to the hyperbaric facility closest to the patient place of presentation is the typical pathway. Occasionally due to capacity or other operational reasons, the patient may require transfer to an alternative hyperbaric facility. Transfer modality and the requirement for clinical escorts will be determined by the acuity of the patient (e.g. self-referring patient may present and travel by private vehicle; a critically ill patient following accidental gas embolism requires transfer by an Adult Critical Care Transfer Service or referring hospital clinicians with NHS Ambulance Service’Evidence sets out the optimal time to treatment from symptom onset is 6 hours[[1]](#footnote-2) [[2]](#footnote-3). To ensure timely access to appropriate care, Hyperbaric Oxygen Therapy must commence within 4 hours of the initial assessment where the patient is deemed as suitable for HBOT.**Assessment**Initial assessment will usually be by telephone. The Hyperbaric Physician must consider the differential diagnosis and give appropriate clinical advice. If HBOT may be indicated, then the patient should be assessed at the closest appropriate NHS commissioned provider of HBOT. If the hyperbaric facility is unable to accept the patient for any reason the Hyperbaric Physician should refer the patient to an alternative NHSE commissioned provider. However, it is the alternative Hyperbaric provider who is responsible for triaging and accepting the patient for treatment.On arrival at the hyperbaric facility, and prior to treatment, the attending Hyperbaric Physician will conduct a comprehensive assessment of the patient to determine whether HBOT is required and any associated care needs during treatment. In some circumstances, the Hyperbaric Physician will attend the patient before arrival at the hyperbaric unit, for example in the Emergency Department. If HBOT is not required, the patient will be discharged or referred to appropriate medical care by the Hyperbaric Physician If the patient’s acuity is higher than that which can be safely managed by the local provider, referral to another appropriate service will be supported by the Hyperbaric Physician. Patients aged 16 and below must have access to appropriate specialist children’s services including paediatricians and qualified children’s nurses. **Treatment** Standard treatment for DCI or gas embolism takes approximately 5 hours but many patients require longer treatment depending on severity of injury and response to treatment. The treatment must be conducted under the supervision of a Hyperbaric Physician. Emergency patients with DCI or gas embolism must receive their initial treatment in a fixed multiplace chamber, of at least 180cm height, with at least two compartments (an ante chamber and a main chamber) in line with standards set out in section 7.5 (Essential Equipment and/or Facilities)Depending on clinical condition and response to hyperbaric treatment, which must be assessed by a Hyperbaric Physician at the end of each hyperbaric treatment session, a patient will be discharged from the hyperbaric facility, and this may include for further care, observation and follow up as appropriate. The patient may require further HBOT, either as a readmission from the supporting hospital or as an outpatient. If a monoplace chamber is used for follow-up treatments, then a risk assessment must be completed for each patient to determine suitability for treatment in a monoplace chamber. **Treatment of the critically ill or deteriorating patient**Wherever possible providers should be co-located with Adult Critical Care services to enable the sharing of resources supported by agreed clinical governance arrangements and be capable of delivering Critical Care throughout the duration of hyperbaric treatment. All providers must have appropriate service level agreements in place with local providers of Adult Critical Care which define working arrangements and include appropriate clinical governance for critical care patients treated with HBOT.In situations where the patient deteriorates and becomes critically unwell during Hyperbaric treatment, services must provide interventions to support life until the patient can be transferred to an appropriate alternative setting. Transfer modality and the requirement for clinical escorts will be determined by the acuity of the patient (e.g. self-referring patient may present and travel by private vehicle; a critically ill patient following accidental gas embolism requires transfer by an Adult Critical Care Transfer Service or referring hospital clinicians with NHS Ambulance Service’**Discharge, continuing care, and rehabilitation** Patients will be assessed by the Hyperbaric Physician at appropriate intervals (such as in between HBOT sessions and after the final HBOT treatment) to establish whether they are fit to be discharged home or if they require hospital admission or other care. Any patient who requires ongoing acute care will be referred to the nearest appropriate acute provider. Should there be insufficient capacity within the nearest provider the next nearest provider should be considered for onward referral and ongoing care. A discharge letter will be provided to the patient’s GP, with copies to the patient as appropriate. The letter will recommend any further healthcare measures that might be necessary such as outpatient appointments, onward referral for further investigation, specialist opinion or input from other services such as physiotherapy. Specific discharge advice will be provided, tailored to and to guide the individual patient. This may include recommendations regarding a period of abstinence from diving, safety to return to activities such as driving or flying or other relevant advice. Appropriate follow-up will also be defined. Providers are required to offer a follow-up review of patients treated by either phone call, video call or face to face, within 3 months of treatment. This review should include completion of an appropriate qualitative tool, such as EQ5D.  |
| **7.3**  | **Clinical Networks**There is no formal clinical network in place for the provision of Hyperbaric Therapy Oxygen Services, however all commissioned providers are expected to work collaboratively in the provision of a national service. |
| **7.4** | **Essential Staff Groups**The minimum on-call team consists of a Hyperbaric Physician, an attendant (for a multiplace chamber), an operator and a supervisor. These staff must remain on site and available throughout the entirety of a treatment. There should be at least two staff outside the chamber and one staff inside a multiplace chamber. Additional staff members may be required in line with patient need.**Roles:*** **Hyperbaric Physician**

Responsible for the assessment and treatment of individual patients. A Hyperbaric Physician must have formal training in diving and hyperbaric medicine and be able to enter the hyperbaric chamber during a treatment. A Hyperbaric Physician must be a GMC registered doctor.* **Attendant**

Responsible for direct care of the patient inside the multi-place chamber, within the limitation of their qualification. * **Operator**

Responsible for the safe operation of the chamber system according to the operating procedures. * **Supervisor**

Responsible for all safety during the hyperbaric session. * **Medical Director**

Responsible for the clinical activities of the facility. The Medical Director should have appropriate experience in Diving and Hyperbaric Medicine and have completed training to the level of required of a Hyperbaric Physician. The Medical Director must be a GMC registered doctor and either on the GMC General Practice Register or GMC Specialist Register in a related speciality.* **Critical Care Physician**

Responsible for the delivery of critical care during a hyperbaric treatment. A GMC registered doctor who has appropriate postgraduate qualifications in Anaesthetics and or Intensive Care Medicine and has experience of delivery of critical care in the hyperbaric environment. If the critically ill patient is a child, then the Critical Care Physician must have appropriate training and experience to care for the patient. * Additional staff may include:
	+ registered nurses
	+ paramedics
	+ other healthcare professionals, depending on patient requirements
* For patients aged 16 years and younger additional professionals, such as paediatricians and qualified children’s nurses should be involved in patient care

**Training:*** The training of Attendants, Operators must have successfully completed an externally validated curriculum meeting the requirements defined by the British Hyperbaric Association or European Baromedical Association for Nurses, Operators and Technicians.
* Hyperbaric Physicians must have successfully completed a training programme which meets the competency outcomes of European Diving Technology Committee / European Committee Hyperbaric Medicine ([EDTC / ECHM](http://www.echm.org/documents/ECHM-EDTC%20Educational%20and%20Training%20Standards%20%282011%29.pdf)) at the level of “Diving Medicine Physician”. This may be achieved by successful completion of The British Hyperbaric Association “Core Competency in Diving Medicine” (in draft) or by successful completion of an alternative equivalent training course.

All staff must maintain their skills by training and continuous education which must be documented and in line with relevant professional standards and guidelines. |
| **7.5** | **Essential equipment and/or facilities**Emergency patients with DCI or gas embolism must receive their initial treatment in a fixed multiplace chamber, of at least 180cm height, with at least two compartments (an ante chamber and a main chamber).Any multiplace hyperbaric pressure chamber and the operation of the facility for treating patients must comply with relevant safety and quality standards. Chamber facilities should be able to deliver, at a minimum, oxygen at 2.8 ATA. For the treatment of critically ill patients, appropriate equipment should be used that is compatible with the hyperbaric environment. Equipment and monitoring should meet the Association of Anaesthetists guideline [“Recommendations for standards of monitoring during anaesthesia and recovery 2021](https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/10.1111/anae.15501)”There is a requirement for medical equipment that is manufactured, modified, or otherwise found suitable and appropriately maintained for use in the pressurised environment of a hyperbaric chamber.  |
| **7.6** | **Interdependent Service Components – Links with other NHS services**Prior to treatment:* Ambulance service / Adult Critical Care Transfer Services to transfer patient to unit.
* Critical Care Unit (adult and paediatric)
* Adult Critical Care Transfer Services
* Emergency Department
* Radiology services where imaging is required prior to treatment.
* Ear Nose and Throat services in cases where middle or inner ear barotrauma contributory or where myringotomy is required to facilitate treatment.

Immediately after, or between, hyperbaric treatments agreed access to:* Acute medical, surgical, or other specialty inpatient admission.
* Critical care admission for patients who remain critically ill.
* Access appropriate children’s service for patients 16 years and below.
* Physiotherapy / rehabilitation services

At discharge:* GP
* Physiotherapy / rehabilitation
* Other NHS specialities depending on clinical need.

**Interdependent services**Each provider must have a formal agreement, including transfer and treatment protocols, with identified local hospitals describing how the organisations will co-operate in providing any additional treatment and other aspects of management for patients requiring HBOT. All providers must have agreed protocols in place with a provider of Adult Critical Care to enable the sharing of resources supported by agreed clinical governance arrangements and be capable of delivering appropriate ICU care in line with the relevant guidance throughout the duration of hyperbaric treatment. Providers will work closely with NHS Clinical Networks and other NHS services, including:* Major Trauma Networks
* Adult and Paediatric Critical Care Networks
* Acute Critical Care Transfer Services

**Children and Young People**All children and young people who use services must have defined pathways into children’s, adolescents and young people’s services and must be: * Fully informed of their care, treatment, and support.
* Able to take part in decision making to the fullest extent that is possible.
* Asked if they agree for their parents or guardians to be involved in decisions they need to make.
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| **7.7** | **Additional requirements**Providers are required to submit data to the assigned clinical audit data registry. Providers are required to complete a qualitative tool, such as EQ5D with patients at time of treatment and at time of follow-up. All providers are required to submit information on workforce competency, equipment, and clinical governance arrangements on an annual basis.  |
| **7.8** | **Links to other key documents****Commissioned policy*** [Clinical commissioning policy: Hyperbaric oxygen therapy for decompression illness/gas embolism (all ages)**.** April 2019.Specialised Commissioning Team NHS England](https://www.england.nhs.uk/wp-content/uploads/2018/07/hbot-for-decompression-illness-gas-embolism-v2.pdf).

****Not routinely commissioned:***** [Hyperbaric oxygen therapy for malignant otitis externa (all ages)](https://www.england.nhs.uk/publication/hbot-malignant-otitis-externa-all-ages/)
* [Hyperbaric oxygen therapy for necrotising soft tissue infections (adults)](https://www.england.nhs.uk/publication/hbot-necrotising-soft-tissue-infections-adults/)
* [Hyperbaric oxygen therapy for soft tissue radiation damage in patients with a history of pelvic irradiation for malignant disease (all ages)](https://www.england.nhs.uk/publication/hbot-soft-tissue-radiation-damage-in-patients-with-a-history-of-pelvic-irradiation-for-malignant-disease-all-ages/)
* [Hyperbaric oxygen therapy for carbon monoxide poisoning (all ages)](https://www.england.nhs.uk/publication/hbot-carbon-monoxide-poisoning-all-ages/)
* [Hyperbaric oxygen therapy for diabetic lower limb ulceration (diabetic foot ulcer) (all ages)](https://www.england.nhs.uk/publication/hyperbaric-oxygen-therapy-for-diabetic-lower-limb-ulceration-diabetic-foot-ulcer-all-ages/)

**Applicable National / International Standards:**The provider must take account of the following professional guidance and technical standards where applicable:Technical guidance and facilities standards* [Fire Safety Guidelines for Multiplace Hyperbaric Treatment Facilities. The British Hyperbaric Association. 2018](https://ukhyperbaric.com/documents/british-hyperbaric-association-fire-safety-guidelines-for-multiplace-hyperbaric-treatment-facilities-october-2018/)
* [Guide to Electrical Safety Standards for Hyperbaric Treatment Centres. The British Hyperbaric Association. 1996](https://ukhyperbaric.com/documents/british-hyperbaric-association-guide-to-electrical-safety-standards-for-hyperbaric-treatment-centres/)
* [Health & Safety for Therapeutic Hyperbaric Facilities: A Code of Practice. The British Hyperbaric Association. 2000](https://ukhyperbaric.com/documents/british-hyperbaric-association-health-and-safety-for-therapeutic-hyperbaric-facilities/)
* [BS EN 14931. Pressure vessels for human occupancy (PVHO). Multi-place pressure chambers for hyperbaric therapy. Performance, safety requirements and testing. 2008](https://knowledge.bsigroup.com/products/pressure-vessels-for-human-occupancy-pvho-multi-place-pressure-chambers-for-hyperbaric-therapy-performance-safety-requirements-and-testing?version=standard)

[BS EN 16081. Hyperbaric chambers. Specific requirements for fire extinguishing systems. Performance, installation, and testing. 2013](https://standardsdevelopment.bsigroup.com/projects/2013-02754#/section)* A Code of Good Working Practice for the Operation and Staffing of Hyperbaric Chambers for Therapeutic Purposes. The Faculty of Occupational Medicine. (The Cox Report) 1994
* [Recommendations for standards of monitoring during anaesthesia and recovery 2021. Association of Anaesthetists](https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/10.1111/anae.15501). 2021

Workforce and training standards* [Educational and Training Standards for Physicians in Diving and Hyperbaric Medicine. Joint Educational Subcommittee of the European Committee for Hyperbaric Medicine (ECHM) and the European Diving Technical Committee (EDTC). 2011](http://www.echm.org/documents/ECHM-EDTC%20Educational%20and%20Training%20Standards%20%282011%29.pdf)
* [The Training and Education of Hyperbaric Unit Personnel. The British Hyperbaric Association. 1999](https://ukhyperbaric.com/documents/british-hyperbaric-association-training-and-education-of-hyperbaric-unit-personnel/)
* [Education of nurses, operators, and technicians in hyperbaric facilities in Europe: EBAss/ECHM Resources Manual. European Baromedical Association for Nurses, Operators and Technicians (EBAss) and European Committee for Hyperbaric Medicine (ECHM). 2008](http://www.echm.org/documents/EBAss-ECHM%20Education%20resources%20manual%20-%20Version%202008.pdf)
* [A European Code of Good Practice for Hyperbaric Oxygen Therapy: Review 2022. European Cooperation in Science and Technology Working (COST) Group B14 (Hyperbaric Oxygen Therapy). 2022](https://pubmed.ncbi.nlm.nih.gov/38092370/)

Service standards* [Essential Standards of Quality and Safety,](https://www.cqc.org.uk/about-us/fundamental-standards) Care Quality Commission.
* [Adult Critical Care service specification](https://www.england.nhs.uk/wp-content/uploads/2019/05/220502S-adult-critical-care-service-specification.pdf) (when applicable)
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1. Time to treatment for decompression illness <https://www.hse.gov.uk/research/rrhtm/rr550.htm> [↑](#footnote-ref-2)
2. Fakkert, R.A., Karlas, N., Schober, P. *et al.* Early hyperbaric oxygen therapy is associated with favorable outcome in patients with iatrogenic cerebral arterial gas embolism: systematic review and individual patient data meta-analysis of observational studies. *Crit Care* **27**, 282 (2023). <https://doi.org/10.1186/s13054-023-04563-x> [↑](#footnote-ref-3)