



**Scottish
Ambulance
Service**

Working in Partnership with Universities



Medical Gases

Proof of Concept Audit Report

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1. Purpose of Document

This document provides a summary of the results from the Proof of Concept audit undertaken by six stations on Saturday 9th August, 2025. The aim was to test the in-house developed SAS Cylinder Tracker for usability and reliability and also to validate the scanning process and tactics to maximise coverage. The delegation of station responsibilities for scanning was a decision made by Area Service Managers and Team Leaders.

The lessons learned will help to inform the final planning and approach to maximise coverage of all 1) stations and 2) vehicles, and also take account of 3) locations/groups external to the Service including hospitals, sports stadiums, music venues, BASICS Responders, Community First Responders, and Scottish Mountain Rescue.

A decision is required as to what changes (if any) are required to the approach including resource profile of how responsibilities and accountabilities will be agreed at a station, sub-region and regional level. A date then needs to be agreed and communicated to all stations with adequate planning time and contingency especially allowing for absences can be agreed.

The outcome required from the Service-wide audit is:

1. Within an agreed tolerance e.g. 10%, all vehicles must be searched for cylinders
2. All stations with stores must be searched and scanned
3. All expired cylinders must be returned to BOC; this includes those from Scottish Mountain Rescue, Community First Responders and BASICS Responders

The Project Board is asked to approve the recommended actions noted in this paper.

2. Background

There is evidence to suggest that the Service's medical gas cylinder stock holding exceeds clinical requirements and there is a trend of stock holding steadily increasing.

There has to date not been the facility to accurately track cylinders, nor understand usage rates, re-ordering patterns or variation between stations. Currently BOC delivers cylinders directly to 82 stations. All other stations and base locations replenish stock from one of the 82 stations. Stations contact BOC directly for the return of used cylinders, at which point BOC removes the cylinder from their system and cease charging rental. Typically, [REDACTED] each week to and from the Service so the rate and volume of movement is significant.

Over the life of the gas supplier contract, many cylinders are believed to have been misplaced either left at hospital, left with other emergency services or have remained in vehicles and unused e.g. PRU and Team Leader cars.

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] Moreover, there is insufficient confidence that all stations are suitably invested to be assured that all cylinders in stations, on vehicles and within the Service's ecosystem (including with approved partners) will be accurately counted in a co-ordinated fashion, without barriers to the process. The most significant risk is the lack of commitment from all frontline staff, with the consequence that the fleet is too large and mobile for Team Leaders alone to cover.

[REDACTED]
[REDACTED]
[REDACTED]
Going forward it is considered the BOC cylinder management app can be used to track these, thereby providing traceability to mitigate the risk of future write-offs.

3. The Audit Approach

The system now available to scan cylinders was trialled in Edinburgh, East and Midlothian trial (June – November 2024). This proved scanning to be intuitive and quick – it takes a couple of minutes for staff to scan a cylinder between two locations. The trial was also a change initiative to get crews thinking differently about gases as a clinical commodity, and tracked and reported as such.

Since then, the Service has also undertaken a Service wide audit which was implemented in three phases and has involved participation from every station. The 3 phases took place Dec '24, Feb '25 and Mar '25 and the scope was for all stations to scan cylinders in store and onboard the vehicle fleet during a one-week period.

The high volume of stations and vehicles, combined with the dynamic nature of cylinder movements between locations requires an accepted tolerance by which to measure audit results. In addition, some of the vehicle fleet may be out of service for maintenance or repair. It's therefore inevitable that a percentage of the Service's stock holding will not be counted, thus underestimating the cylinders available. The Fleet department has confirmed the number of vehicles typically off the road due to maintenance, repair or impound should never exceed 25.

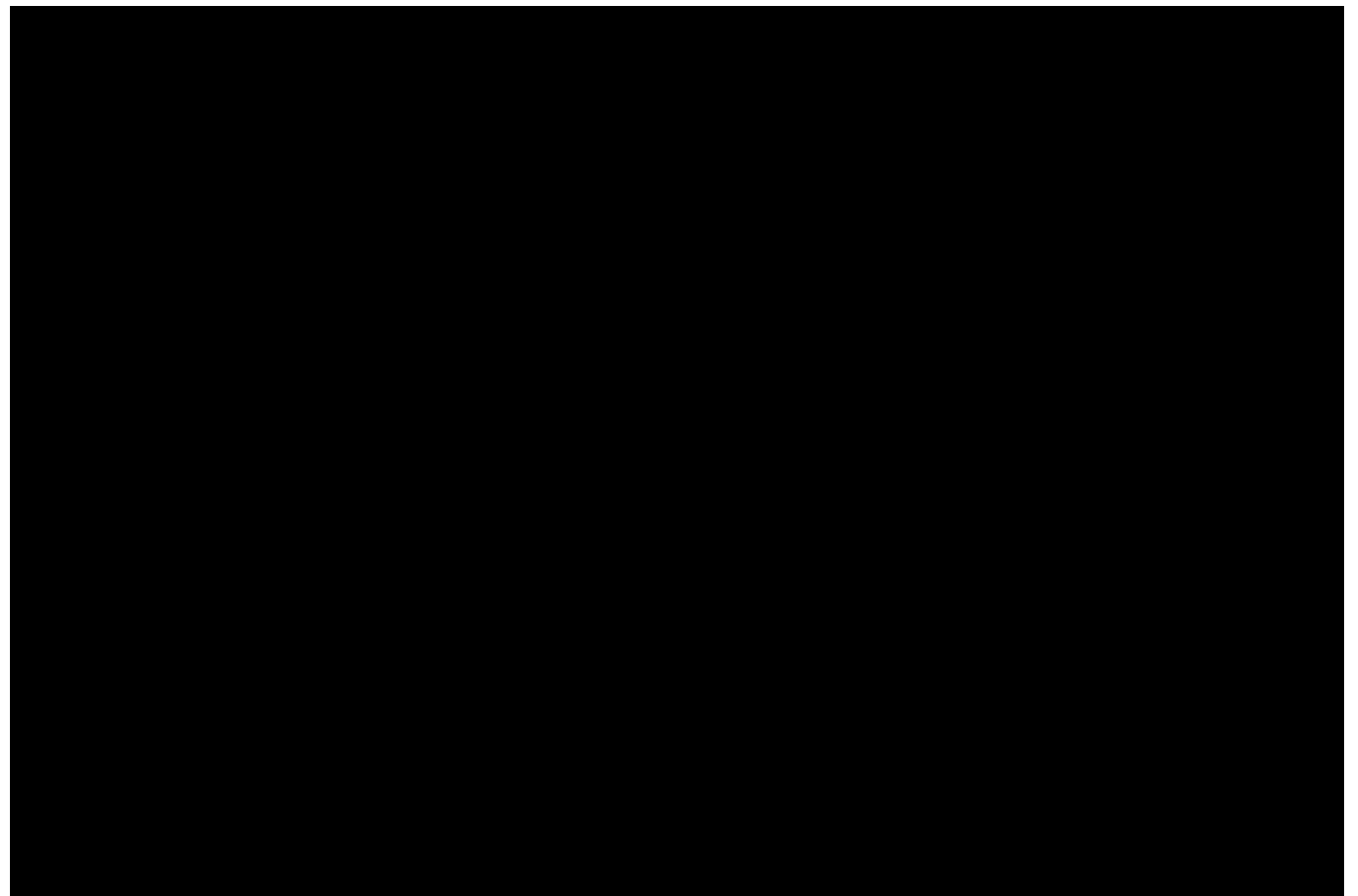
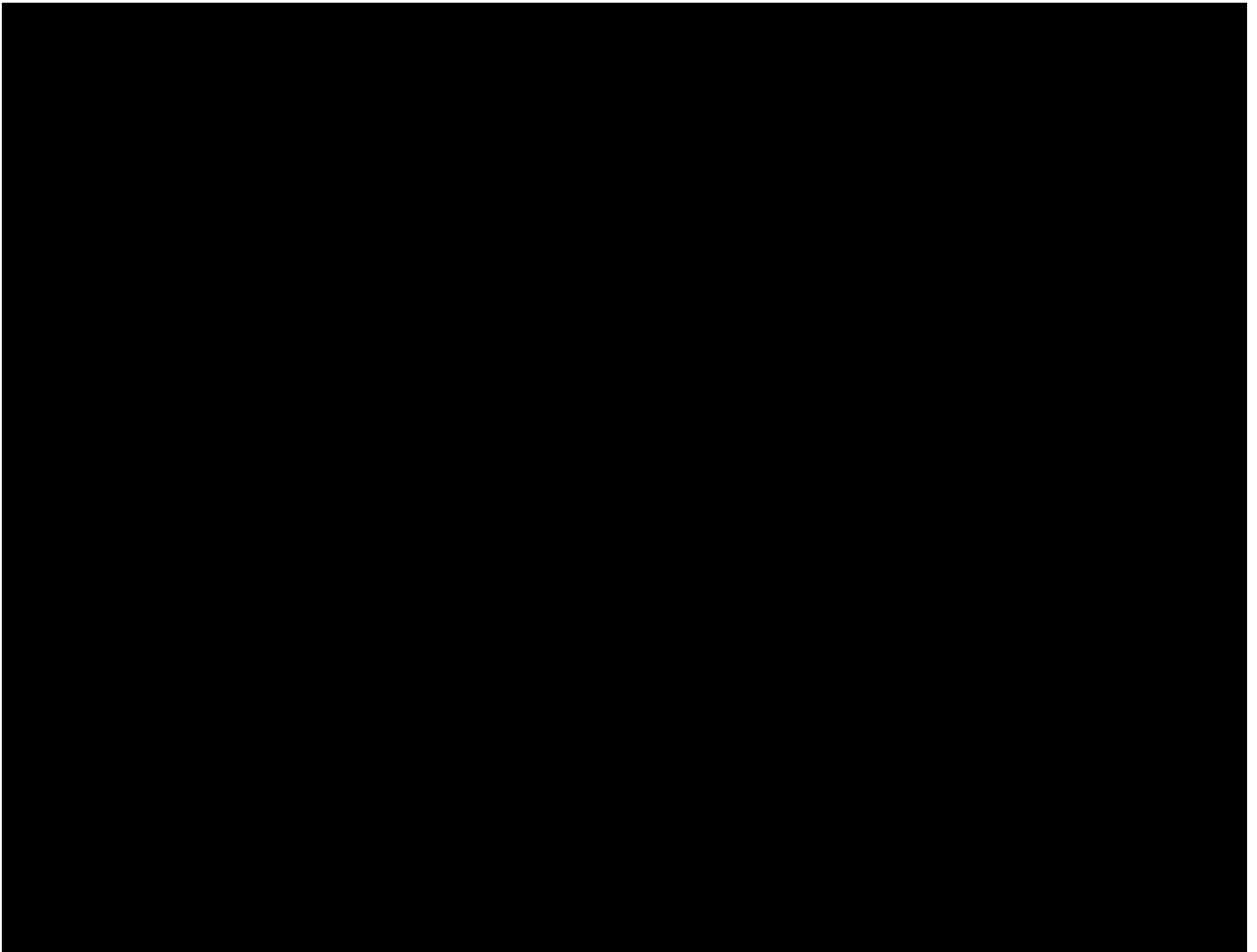
The audit approach duly considered that cylinder rotation is high, [REDACTED]
[REDACTED]. It was therefore imperative that all audit activity was coordinated across all stations within the same week to avoid misinterpreting results to reach wrong conclusions. This was led by the Regions.

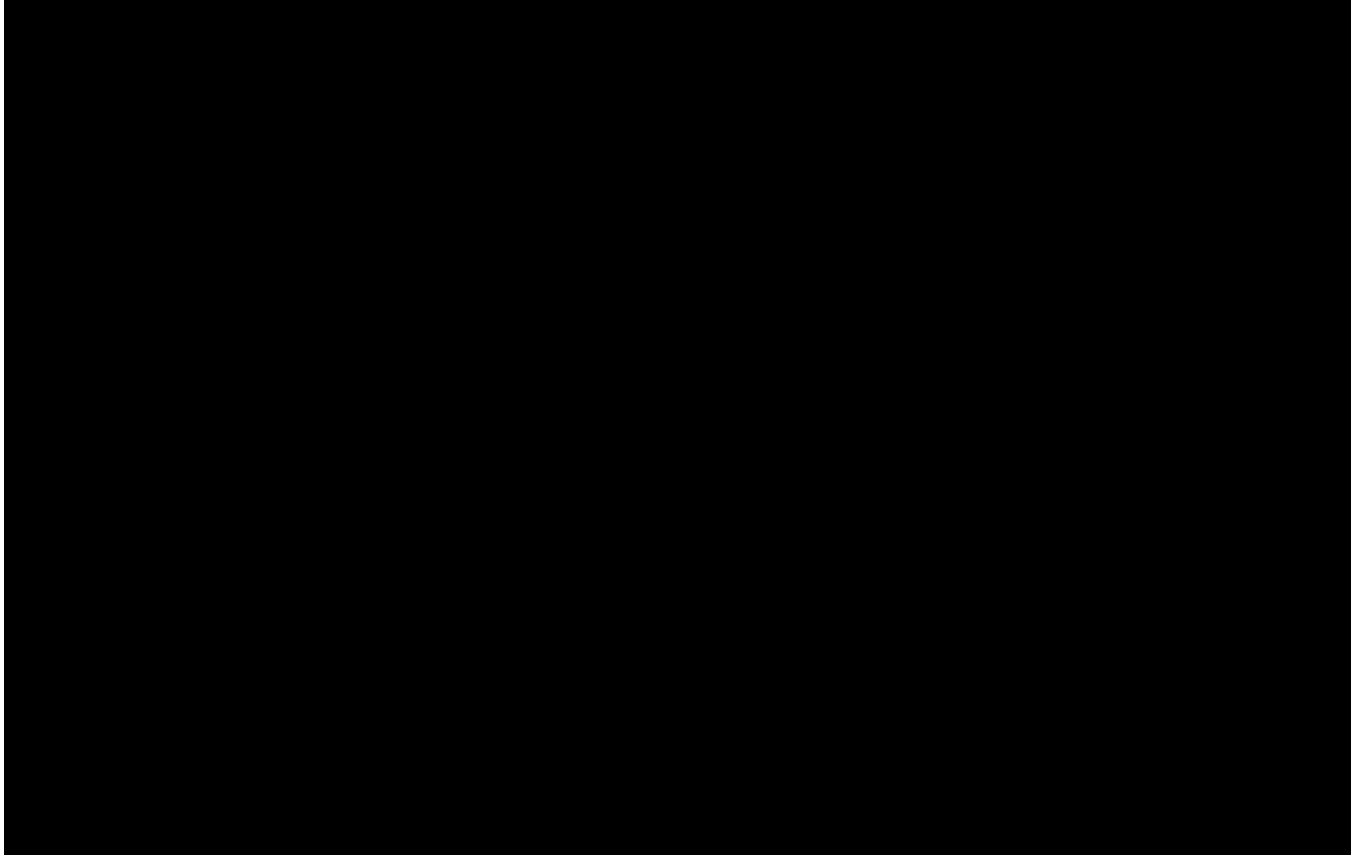
Previous audits undertaken in 2018 and 2021 illustrated that the Service pays rental based on a stock holding considerably higher than the current operational levels which

are required to operate safely. Work was also undertaken in 2019 to confirm the holding required by stations. However, rental costs continue to be based upon a greater number of cylinders than in rotation.

Reasons for this are:

- A report is available to measure rental period which starts from the date of delivery. Cylinders expire after 3 years, based on batch fill date, and are no longer safe for patients or crews to administer following expiry. The cylinders greater than 3 years need returned to BOC. The audit however has not found the majority of these aging cylinders thereby presuming they are not in use but continue to incur rental charges.
- Although cylinders are continuously replenished, we know from the data that the total number of expired and expiring in the next 90 days cylinders fluctuates between 1,700 – 1,800 cylinders. [REDACTED]





To provide the necessary assurance, stations were asked to submit an MS Form to declare the completion of the phase 3 audit, and to identify any vehicles that had been missed or raise any concerns. Of those declarations received, the audit was completed to a high standard and this was verified by manually checking station data in the BOC web-portal to get a snapshot of cylinder distribution.

Stocking holding of Mountain Rescue Teams and both Community First Responders and BASICS Responders were captured via Microsoft Form and were incorporated into the audit results. 



We are also aware of a shortfall in audit results from:

- EPDD
 - ScotSTAR, although losses are understood to be historic
 - Up to 360 of the vehicle fleet potentially carrying gases was not scanned
- 

As described above, a known gap in the audit relates to vehicles with a call sign but which weren't scanned during the audit, this comprises approximately 100 A&E ambulances (including maintenance and operational spares) and 115 PTS vehicles, many of which will also carry gases. [REDACTED].

[REDACTED]

[REDACTED]

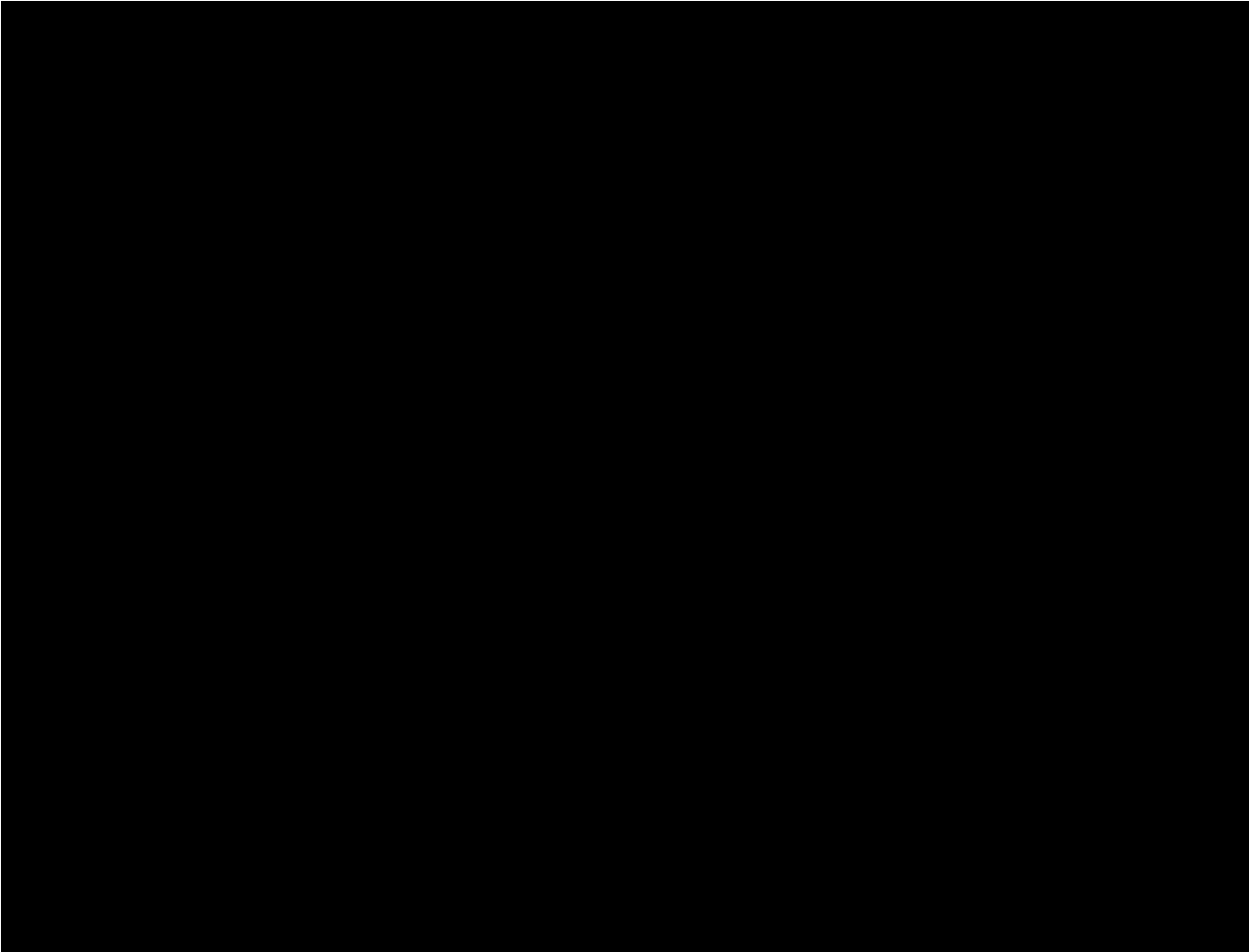
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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



6. The Rollout Approach

To build upon the understanding from the audit data, it is essential to expedite the introduction of daily scanning by frontline A&E crews. Comprehensive assessment of setup requirements to support rollout is in an advanced state.

This includes compilation of user lists to create approx. 4.6k Accura accounts, build a hierarchical structure (see [Appendix F](#)), establish parent/child vehicle/station relationships, implement the agreed station and vehicle naming convention, and undertake a final review of reporting requirements to accelerate the learning from app usage.

User guidance and comms to utilise the app are in development. Guidance is predicated on maximising self-sufficiency during the rollout, minimising post go-live queries and support needs. The rollout is expected to commence during May and be complete by mid October.

Readiness for the Rollout

There are key dependencies on BOC with respect to “just in time” account creation as well as assistance with quality of user guidance/comms to ensure crews are well equipped to start using the app with immediate effect and can be self-sufficient. There

will be a natural ramp up of usage across stations and sub-regions but all crews with Service smartphones will be required to take personal responsibility for scanning.

There is a dependency on Team Leaders and Area Service Managers to ensure crews scan the cylinders and articulate the importance by conveying consequences of poor cylinder management.

A communication plan led by the clinical team, linked to the clinical needs and obligations of the clinicians is under development with approval anticipated from the Project Board required in May, prior to commencement of rollout.

7. Audit Redo to Improve Accuracy

It is recognised that the significant shortfall in recording of the cylinders needs to be reassessed and verified. A consistent approach, leadership, commitment and prioritisation needs to be enforced. The Project Team is working with the clinical team to also reinforce the need for a further audit and the ongoing scanning as business as usual.

A proposed consistent approach to maximise coverage and yield is as follows:

- Start audit prior to dayshift shift change and continue until after nightshift shift change to catch maximum number of vehicles at station
- Count stock in store when most vehicles are out (since these are static)
- Return to station next day to identify vehicles unavailable on day 1 to bridge the gap
- Go to hospital emergency departments to locate vehicles missed at station
- Only inaccessible vehicles e.g. in workshops for maintenance or bodyshop for repair should be remaining. Check location of these vehicles and confirm schedule for their return.
- Check feasibility to have a colleague scan vehicles at SAS workshops.
- Complete the audit declaration form to confirm results. This provides scope to identify missed vehicles or report any issues prior to official audit end, when the gap can still be bridged.

This robust approach assumes that any remaining truly inaccessible vehicles will be minimised.

[REDACTED]

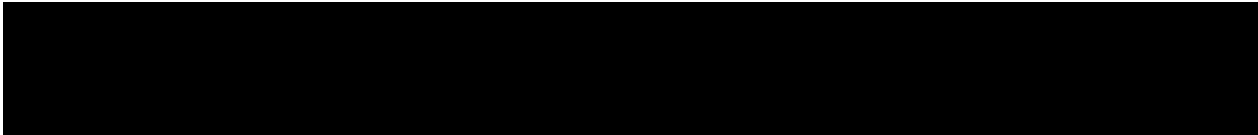
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[REDACTED]

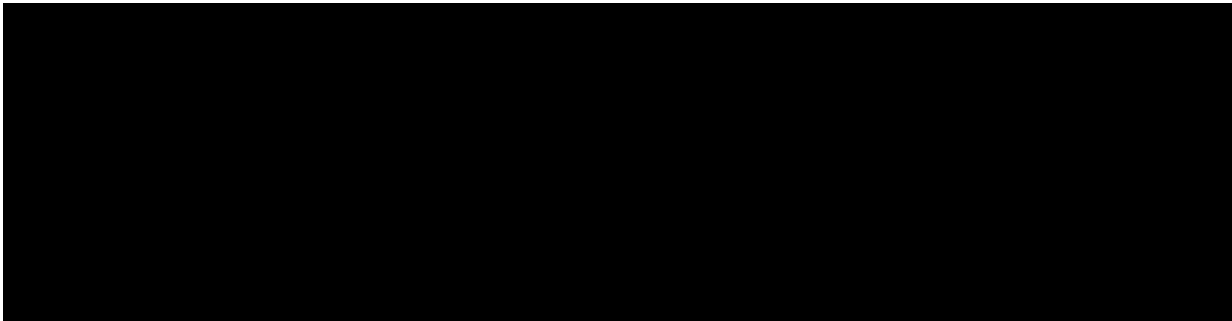
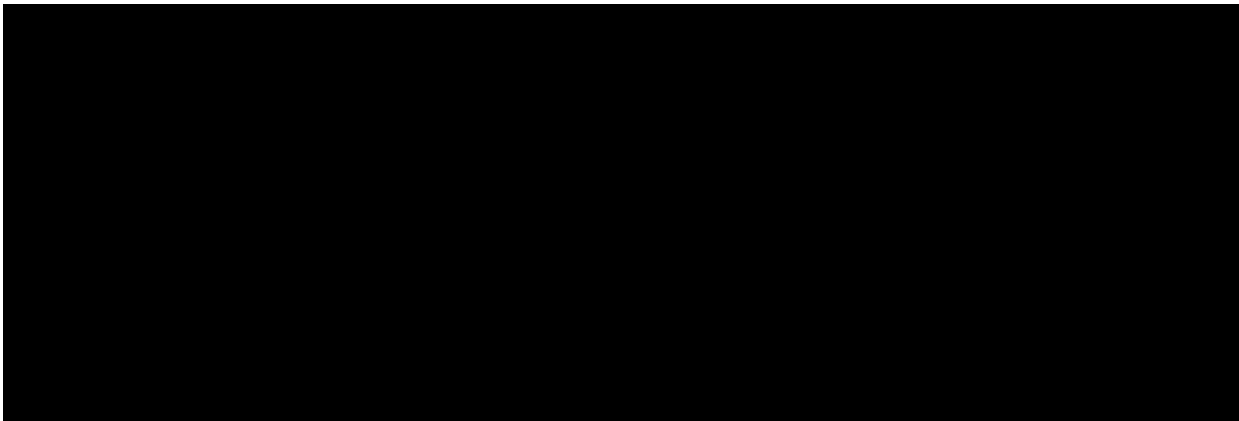


11. Future Reporting and Monitoring (BAU)

Once fully operational and handed over to business as usual, there will be a requirement for all A&E ambulance crews to routinely use the app to move cylinders between locations.

Provided this happens, a wealth of data will become available to continuously improve the Service's understanding about gas usage, with scope to change behaviours including ordering frequency, practices of recovering cylinders from hospitals and other emergency services, and a re-evaluation of stock holding on specific vehicle types and stock holding in stores, based on the pending update to medicines management guidance to optimise stock holding.

The proposed rollout plan is depicted in [Appendix H](#). It should be noted that the steady rollout is chosen in favour of a “big-bang” for practical reasons, given the 4.6k user accounts to be created and a need to promote use through targeted communication with sub-regions.



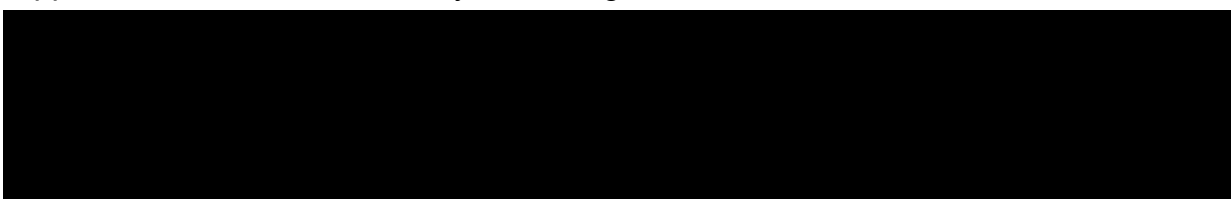
Once the app is in daily use, confidence should grow that cylinder locations are correctly reflected. It will be possible to track internal moves across the Service and identify crews and vehicles who are routinely using the app. It will be possible, if a little time-consuming, to reverse engineer and identify crews and vehicles that are excluded from the data, despite carrying gases.

If there is an enquiry about a particular cylinder(s) or about usage by particular crews, a rich dataset will be available, provided that internal moves are recorded. This should include moves or exchanges with other emergency services, at hospitals and between the Service, Responders and Mountain Rescue Teams.

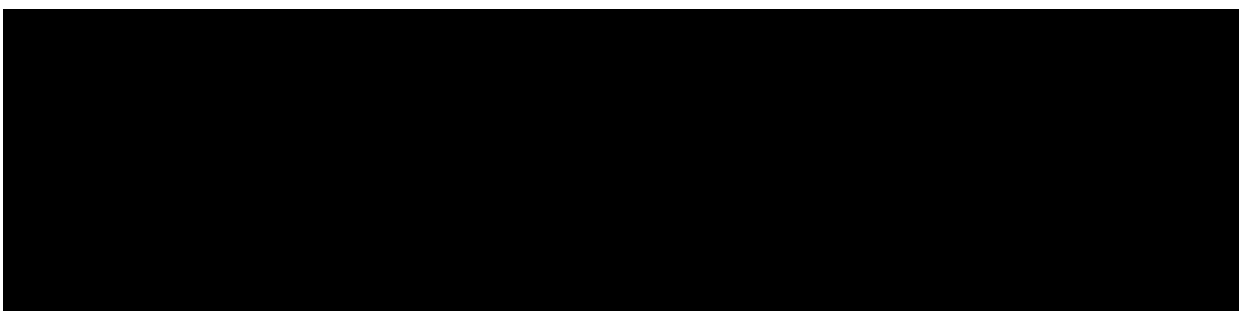
By building the relationships between stations, reports will help the Service optimise re-ordering e.g. in Forth Valley all deliveries are to Falkirk which services 5 other stations in the sub-region.

The current plan anticipates that the Accura cylinder management app rollout will start mid-May and be complete by mid-October. This is dependent on a number of critical actions to be performed by BOC including the creation of accounts, provision of training materials, training session for Admin users and building of the organisational hierarchy and customising of existing reports to reflect the hierarchy (this is all currently under review).

In parallel, a further audit will be scheduled for all stations, although the specific approach and timeline has not yet been agreed.



12. Recommendations



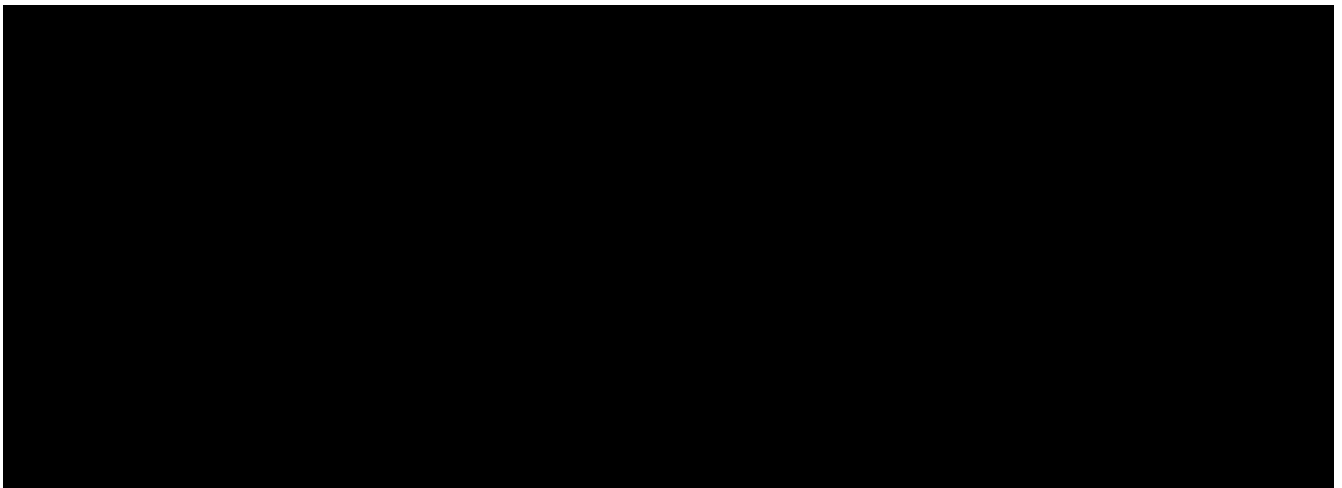
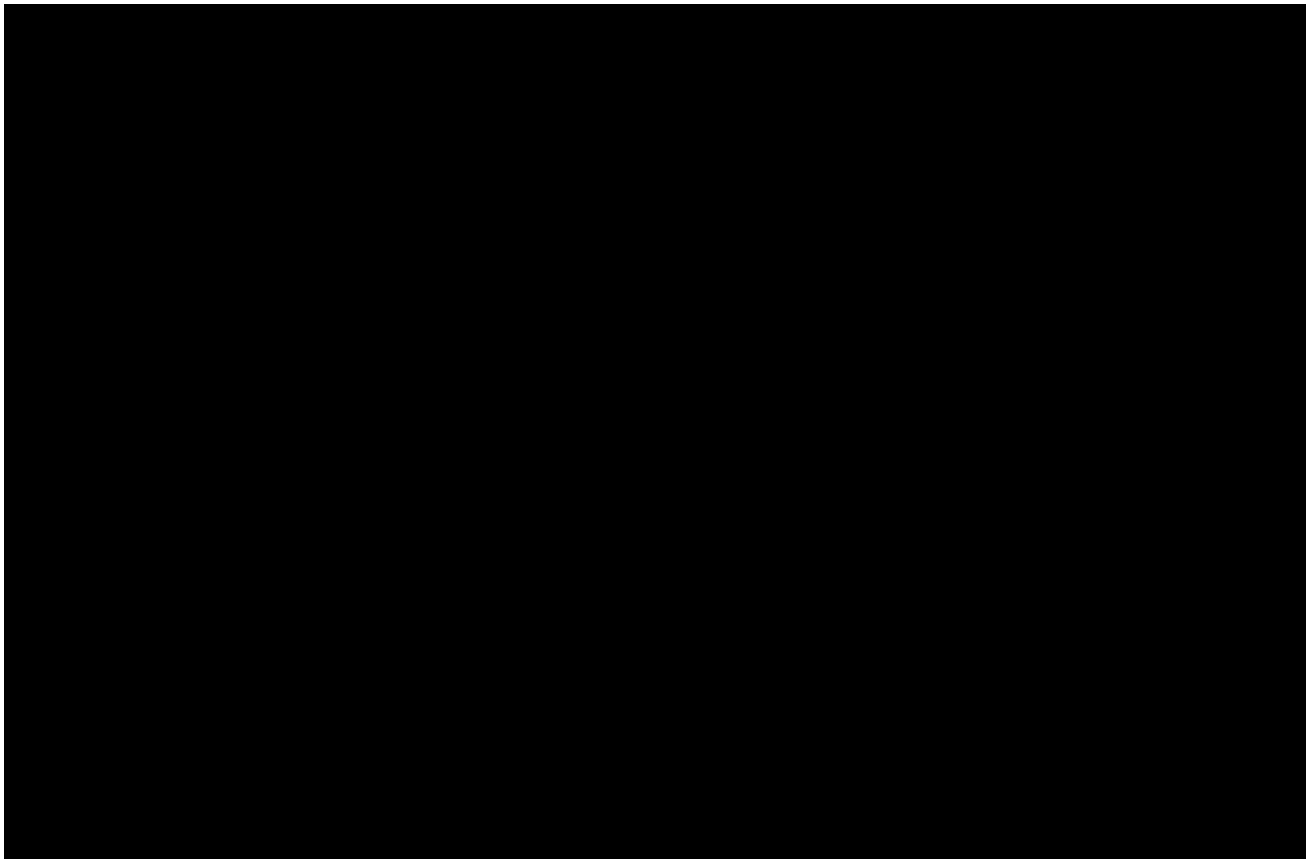
Direct ownership by Regional Directors will be critical to ensure that every station has resources allocated from the beginning to the end of the agreed audit period. Anecdotally, one of the reasons for variation in audit execution is the lack of continuity of those involved between phases and in understanding the distinction between counting cylinders in stores (a stock take) and moving cylinders to vehicles or to another station (if applicable).

If stations have reason to question the BOC deliveries and returns data available, it should be considered whether BOC is permitted to continue to deliver and collect cylinders without this being overseen by a station staff member. The current delivery model is based on trust, with BOC having direct access to station stores. Given the significance of the value this may need to be revisited.

An alternative approach is that upon arrival at a station, the BOC delivery driver is requested to ask for a Team Leader who will be present throughout the delivery and collection process.

It has also been agreed to that there should be a SAS lead for Medical Gases, A postholder is in place and has been tasked with assessing improvements to the management of gas deliveries and returns to evidence the receipt of these and provide updated procedures to BOC to ensure compliance.

More generally, the Gases Clinical Lead will responsible for the evaluation and then implementation of internal control systems within stations, air bases and co-location or home bases to help ensure the prompt return of cylinders potentially via Inphase systems or use of eforms in M365.



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

