



The Global Language of Business

The Management of Returnable Gas Cylinders using GS1 Standards

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Table of Contents

1. Executive Summary	5
1.1. Recommendations	5
2. About this document	5
2.1. Background	5
2.2. Scope	6
3. Benefits	6
4. Gas Cylinder Management	6
4.1. Traditional Order Process	6
4.2. Vendor Managed Inventory Process	7
4.3. Delivery and collection within the trust	7
4.4. Current Issues	7
5. Stake Holders and requirements	7
6. GS1 Standards	8
6.1. Identifiers	8
6.2. Bar Codes and RFID Tags	8
6.3. Information Exchange	9
7. GS1 Identifiers for Gas Management	9
7.1. Gas Contained within a Cylinder - GTIN	9
7.2. Physical Location Identification - GLN	10
7.3. Organisational Identifiers - GLN	10
7.4. External Service Provider Identification - GLN	10
7.5. Patients - GSRN	10
7.6. Staff and Service Providers - GSRN	11
8. Best Practice Processes	11
8.1. Prerequisites	12
8.2. Orders	13
8.3. Receipt from Supplier	13
8.4. Delivery from store to trust theatres	13
8.5. Allocation to Patients	14
8.6. Collection from trust departments to store	14
8.7. Supplier collection from store	14
8.8. Monthly cylinder audit	14
8.9. Invoicing and Payment	14
8.10. Minimising gas and cylinder rental costs	14
9. Creating GS1 Identifiers and Labels	15
9.1. Creating GLNs	15
9.2. Physical Location Labels	15
9.3. Interpreting GRAI labels	16
10. Getting Started	16

11. Appendix 1 – BOC Cylinders	17
11.1. BOC Bar Codes.....	17
11.2. Other Suppliers	18
12. Appendix 2 – GS1 standards	19
12.1. GS1 Keys for Gas Management.....	19
12.1.1. GIAI – Global Individual Asset Identifier.....	19
12.1.2. GLN – Global Location Number	19
12.1.3. GSRN – Global Service Relation Number	19
12.1.4. SSCC – Serial Shipping Container Code	19
12.1.5. GTIN – Global Trade Item Number.....	19
12.1.6. Global Returnable Asset Identifier - GRAI.....	20
12.1.7. GDTI – Global Document Type Identifier	20
12.2. GS1 Bar Codes	20
12.2.1. GS1 128.....	20
12.2.2. GS1 DataMatrix	20
12.3. Information Exchange.....	21
13. References	22

1. Executive Summary

Medical gases are typically the financial responsibility of the Pharmacy department although delivery and collection of gas cylinders within the hospital is carried out by hospital porters following requests from clinical staff. Recording of gas cylinder movements is commonly through paper based systems which are very time consuming to analyse.

Pharmacy departments are concerned that they do not have sufficient control over the use of gas cylinders and that this could lead to holding too much, or possibly too little, stock, and payment of rentals for cylinders that are not required.

The use of GS1 standards together with bar code technology can provide the management information and process controls to manage gas cylinders more effectively leading to lower costs, improved service and better allocation of costs to specific departments.

By scanning gas cylinders' unique bar code as they move through the hospital, their location can be recorded in a database which then has all the information required to

- check gas suppliers' invoices for gas purchased and for cylinders rented
- highlight areas where cylinders go missing so that appropriate action can be taken.
- allocate gas costs correctly to different theatres and departments

Benefits of the improved management information provided through bar code scanning include:

- Reduction in cylinder rental charges or fines from suppliers
- Reduction in inventory levels for gas cylinders
- Accurate, automated invoice reconciliation
- Accurate allocation of the costs of gas usage to departments

Currently only BOC is using GS1 bar codes on their gas cylinders.

1.1. Recommendations

- GS1 identifiers and bar codes should be used to identify gas cylinders, physical locations, organisational entities, staff, patients and products.
- Management of gas cylinders should be integrated into any eProcurement and inventory management initiatives that the trust may have as a response to the DH eProcurement strategy.
- Where possible paper based systems should be replaced by automated bar code reading devices which are able to update systems without the need for rekeying information
- New bar code scanners procured by trusts should be capable of reading 2D (two dimensional) bar codes such as the GS1 DataMatrix as agreed by the GS1 Healthcare User Group http://www.gs1.org/docs/healthcare/GS1_HUG_ps_Camera_Based_Scanners.pdf

2. About this document

2.1. Background

This document was commissioned by the Health and Social Care Information Centre (HSCIC) in order to provide best practice guidelines on how GS1 standards can be used to improve the management of assets within the NHS. It explains the use of Automatic Identification and Data Capture (AIDC) technology to improve data accuracy, to reduce administration time and provide better management control. In addition the document shows how GS1 standards can help trusts to meet the challenge of a paperless NHS by 2018 set by Jeremy Hunt, the current Health Secretary.

2.2. Scope

This document covers the delivery and collection of gas cylinders to and from NHS organisations and the management of the movement of gas cylinders within NHS sites. It does not address the general safety issues involved in handling medical gases or the handling and use of medical gases by clinical staff in medical procedures.

The document does not address the management of medical gas by medical gas suppliers. It is assumed that the supplier's processes will maintain comprehensive records to provide the necessary management controls over the production and delivery of medical gases.

The document assumes the use of GS1 bar codes in managing gas cylinders. Use of RFID may be included in future versions of the guideline.

3. Benefits

Improvements in the management information and control of gas and gas cylinders will lead to:

- Reduction in cylinder rental charges or fines by suppliers
 - Reduction in storage charges for empty cylinders
 - Reduction in the number of missing cylinders
- Reduction in inventory levels for gas
 - Improved demand analysis and forward planning
 - More accurate reorder levels and reorder quantities
- Accurate, automated invoice reconciliation
- Accurate allocation of the costs of gas to departments

4. Gas Cylinder Management

Trusts use a variety of gases in a number of different departments. The gas is delivered in cylinders to a small number of central stores from which porters deliver the gas on to where it is required. Porters also collect empty cylinders and return them to the central store from where they are collected by the gas supplier. The gas supplier charges for the gas itself and also for the rent of the cylinders in which the gas is contained.

Pharmacy is typically responsible for the management of gas cylinders within the trust. In some trusts gas is ordered as required through a normal requisition process – the Traditional Order Process, in others the gas supplier is responsible for managing the gas inventory so that gas is available to meet the needs of the trust – the Vendor Managed Inventory Process.

Pharmacy departments are concerned that they do not have sufficient control over the use of gas cylinders and that this could lead to holding too much, or possibly too little, stock, and payment of rentals for cylinders that are not required.

4.1. Traditional Order Process

In this process trusts place orders directly on the supplier for the gas cylinders they require. The supplier delivers the ordered gas cylinders to the central store and the trust checks that the correct cylinders have been delivered making a note of any exceptions. The supplier invoices the trust for the gas delivered and the trust checks the invoice against the orders, deliveries and exceptions before authorising payments. The supplier also collects empty cylinders and issues an invoice for the rental of any cylinders still held by the trust.

4.2. Vendor Managed Inventory Process

In this process the trust sets target inventory levels for each type of gas cylinder. The supplier then delivers cylinders to ensure these target levels are maintained based on past patterns of use. The supplier provides reports of what cylinders have been delivered and collected. The supplier issues invoices for the gas delivered and for the rental of all the cylinders still held by the trust. In addition the trust may make emergency orders for products in danger of being out of stock possibly due to heavier than normal usage.

4.3. Delivery and collection within the trust

On request a hospital porter delivers full cylinders from the local store to wards, theatres and departments and also collects empty cylinders and returns them to the local store. The KPI for this service is typically less than 1 hour, from request to delivery by the porter, due to the importance of gas supplies for patients.

4.4. Current Issues

Current issues facing managers responsible for gas cylinders include

- Additional costs of emergency orders
- Loss of cylinders
- Inability to check supplier invoices adequately
- Effective management of recalls of faulty gas cylinders
- Expiry date management of gas cylinders
- Inability to allocate gas costs accurately to departments/budget holders
- Managing stock rotation for cylinders removed from the store
- Controlling the local hoarding of cylinders by hospital staff

5. Stake Holders and requirements

Table 1 Requirements

Pharmacy	<p>Need to ensure that stock levels of cylinders are appropriate for the usage patterns in the hospital</p> <p>Need to ensure that the right gas is available when needed</p> <p>Need information to monitor and control the supply of gas and gas cylinders to minimise costs and maximise service levels</p> <p>Need to allocate gas costs to the departments incurring them</p> <p>Need to check that supplier invoices are correct</p> <p>Need to be able to quickly and efficiently locate and remove faulty cylinders or those close to their expiry date</p>
Clinical, A&E. wards, theatres, ambulances etc.	<p>Need access to the right gas when required.</p> <p>Need to minimise the administration associated with supply of gas</p> <p>Need to check that costs allocated to them are correct.</p>
Estates/porters	Need well defined, straightforward and efficient processes
Finance and Senior Management	<p>Need an auditable, efficient process for authorising and allocating payments.</p> <p>Need the ability to allocate asset costs to relevant budget holders</p>

6. GS1 Standards

The Department of Health recommends using GS1 standards as documented in “Coding for Success” published in February 2007. The NHS mandates GS1 standards in “Better Procurement, better Care” published in August 2013 and the “NHS eProcurement Strategy” published in April 2014. NHS England and the Health and Social Care Information Centre (HSCIC) require the use of GS1 standards as documented in the Information Standards Board ISB0108.

6.1. Identifiers

ISB 1077 and ISB 0108 define the use of GS1 standards and how they should be used by the NHS and its suppliers for identifying products, patients, locations and assets and for the use of bar codes. The benefits of using GS1 standards include

- GS1 identifiers are globally unique, they do not need to be changed when trusts separate or merge and they can be used by suppliers and contractors without requiring the maintenance of complex cross-reference tables.
- Bar code and RFID readers can recognise and select GS1 bar codes and RFID tags even when other bar codes or tags are present using features that are ISO standards
- Data in GS1 bar codes and RFID tags has a well-defined structure that can be understood by any relevant application

All GS1 identifiers (also known as keys) start with a sequence of numeric digits called a GS1 Company Prefix, which GS1 Member Organisations (MOs), such as GS1 UK, license to individual companies. Subsequent digits or characters are appended to the prefix to create unique identifiers for specific items.

GS1 works closely with ISO to ensure that GS1 standards are recognised by ISO. GS1 has recently been given special status (JTC 1 PAS Submitter) which speeds the process for GS1 standards to become ISO standards.

Fundamentally GS1 standards provide an infrastructure of identifiers and data carriers, including bar codes and RFID tags, which can be used by any application in any organisation. GS1 standards enable integration of systems within the trust and allow information from external providers' systems to be incorporated easily into the trust's information management and control systems.

GS1 recommends that the identifiers should have no meaning; they should be used purely as a key to link to information in a database. Attempting to structure keys to contain information about the object often leads to problems since such schemes are rarely flexible enough for the long term.

Note that GS1 identifiers must never be re-used in a healthcare context.

6.2. Bar Codes and RFID Tags

GS1 standards specify the size of bar codes to ensure that they can be read reliably by a wide range of equipment in different environments. Actual readability of bar codes will depend on the quality of the printer used to print them and of the scanner used to read them.

GS1 linear or one dimensional (1D) bar codes (GS1-128) may be too large to fit on some items. GS1 DataMatrix, a two dimensional (2D) bar code, can be much smaller and can be read more reliably. GS1 DataMatrix is likely to be mandated for pharmaceutical and other products purchased by the trust. For these reasons GS1 DataMatrix is the preferred option. However two dimensional codes may not be readable by some legacy bar code readers in the trust. (See section 12.2 GS1 Bar Codes)

The information in a GS1 bar code is normally also shown in human readable text close to the bar code.

When a GS1 key is encoded in a GS1 barcode it is prefixed by an Application Identifier (AI) number which identifies the type of GS1 key so that it can be interpreted and processed correctly. AIs are normally shown in brackets in the human readable information, however the brackets are NOT included in the bar code data.

The following bar code shows a GS1 bar code. The initial 414 shows that what follows is a Global Location Number identifying a physical location and so can be processed accordingly.



6.3. Information Exchange

GS1 standards also enable the exchange of information between companies in the following ways

Electronic Messages

GS1 has defined standard electronic commerce (eCom) messages for a wide variety of business transactions including orders, invoices, and delivery notes.

Data Pools

Manufacturers can input data into GS1 standard data pools for automatic onward delivery to their customers. This ensures that customer receive the correct data in a standard form from all manufacturers while manufacturers only have to enter the data once for all their customers. The GS1 standard data pools are fully compliant with the US Global Unique Device identification Database (GUDID) but can also provide significant additional information and functionality.

Visibility Data

GS1 bar codes facilitate recording of events as objects move through the supply chain and during their subsequent use. This information is stored in GS1 standardised event repositories which can then be accessed by authorised users to provide full visibility of products and other objects.

7. GS1 Identifiers for Gas Management

This section reviews where GS1 standards apply to the identification of gas cylinders and the capture of information about them. More information on GS1 standards is included in section 0 Gas Cylinders - GRAI

Each cylinder should be identified by a GS1 Global Returnable Asset Identifier (GRAI), including the optional serial number, encoded in a GS1 compliant bar code and/or RFID tag.

The British Compressed Gases Association (BCGA) and the Medicines & Healthcare products Regulatory Agency (MHRA) have agreed that all medical gases should have product specific valves; i.e. a specific gas delivered at a specific pressure. Therefore the GRAI should be allocated to a cylinder/valve combination; if the valve is changed then a new GRAI must be allocated.

A unique GTIN should also be assigned for each different gas cylinder rental service to enable accurate pricing and invoicing.

Gas suppliers may additionally wish to identify the cylinder and valve separately for their own internal processes which can be done using the GS1 Global Individual Asset Identifier (GIAI). Identifying the valve and cylinders separately is outside the scope of this document; however any bar codes used for this purpose must not be capable of being confused with the bar codes required for cylinder tracking by the trust.

7.1. Gas Contained within a Cylinder - GTIN

The gas product should be identified by a GS1 Global Trade Item Number (GTIN). The GTIN should be used in any gas orders or invoices and should be encoded in a GS1 compliant bar code on the gas cylinder.

7.2. Physical Location Identification - GLN

Each relevant location should be identified by a GS1 Global Location Number (GLN). Relevant locations will include central gas stores and wards and theatres where gas cylinders are stored and used. Suppliers will be able to use the trust's delivery location GLNs without having to maintain complex internal cross reference tables. See also the paper "Recommendations on the use of GLNs in NHS Trusts" in Section 13 - References.

The GS1 UK web site provides a Numberbank function where GLNs and their associated description can be created and stored. This ensures that GLNs are formed correctly including the necessary check digit. A bulk up and download facility is available making it straightforward to integrate GLNs into the trust's internal systems. For more information email healthcare@gs1uk.org or phone 0808 1728390.

It is important to ensure each relevant location is identified by one and only one GLN. Estates will probably already have a database of hospital locations to which a field for the GLN can be added. As the layout of the hospital changes estates can add new GLNs as necessary. (See GS1 UK paper "Recommendations on the use of GLNs in trusts")

It is suggested that estates takes the lead in managing and maintaining an internal database of GS1 GLN physical location identifiers and the installation of the associated GLN bar code labels.

A label containing the GLN in both human readable format and in a GS1 bar code and/or GS1 RFID tag should be attached to each location where gas cylinders are stored. This will enable applications, including those of external contractors, to use the bar codes and RFID tag data directly within their systems. For example delivery services or other outsourced services will be able to use the location bar code to confirm the correct delivery location and then to record where the delivery was actually made or where the collection occurred.

7.3. Organisational Identifiers - GLN

Budget holders and departments should also be identified by a GS1 GLN. In addition to their use in physical locations the GLN can also be used to provide a unique reference to identify "bill to" and "ship to" information within supplier orders and invoices.

The GS1 GLN Numberbank as described in Section 7.3 Physical Location Identification can be used to create GLNs for budget holders and departments.

Finance or ICT will have an existing database of codes for departments and budget holders. GS1 UK suggests that an additional field should be created to contain the associated GLN. The existing budget codes can continue to be used internally but the GLN will be used when communicating outside of the trust.

GLNs are expected to be an important part of the NHS eProcurement strategy due to be published in Q2 2014.

7.4. External Service Provider Identification - GLN

External supplier of products and services, such as providing gas cylinders, should identify themselves using their own unique GLN. This will enable the trust to use this identifier in their internal systems and in their electronic orders without having to maintain complex internal cross reference tables.

7.5. Patients - GSRN

Patients should be identified by a wrist band with a GS1 DataMatrix bar code compliant bar code encoding the NHS number as a GS1 Global Service Relationship Number (GSRN); increasingly all patients will have such wrist bands. **ISB 1077 AIDC for Patient Identification,**

the NHS standard for patient wrist bands, is available on the ISB web site at <http://www.isb.nhs.uk/documents/isb-1077>

7.6. Staff and Service Providers - GSRN

It may be necessary to record which staff delivered or collected the gas cylinders. Healthcare professionals and other trust staff should be identified by a GSRN (See section 12.1 GS1 Keys for Gas Management). External service provider staff should be identified by a GSRN provided by the service provider.

The GSRN can be encoded in a GS1 Bar Code or RFID tag incorporated in an identity badge.

8. Best Practice Processes

The Department of Health Medical Gases Health Technical Memorandum states that

“8.153 The following should be implemented:

.....

(b) a record of issues should be kept. The record should include the name of gas, size of cylinder, date of issue, expiry date, number of cylinders issued and the department, ward or name of recipient. This may be covered by the proprietary stock management system.

8.154 A written procedure should also be used for the return of empty or unused cylinders to the main store and for return to the supplier.”

This section describes how GS1 standards and bar codes can be used to automate the recording of this information into computer systems and how that information can be used to minimise cylinder and gas charges. Section 3 Benefits summarises the benefits that accurate computerised information about gas usage can provide.

The figure below shows the information and physical flows including where bar code scanning takes place.

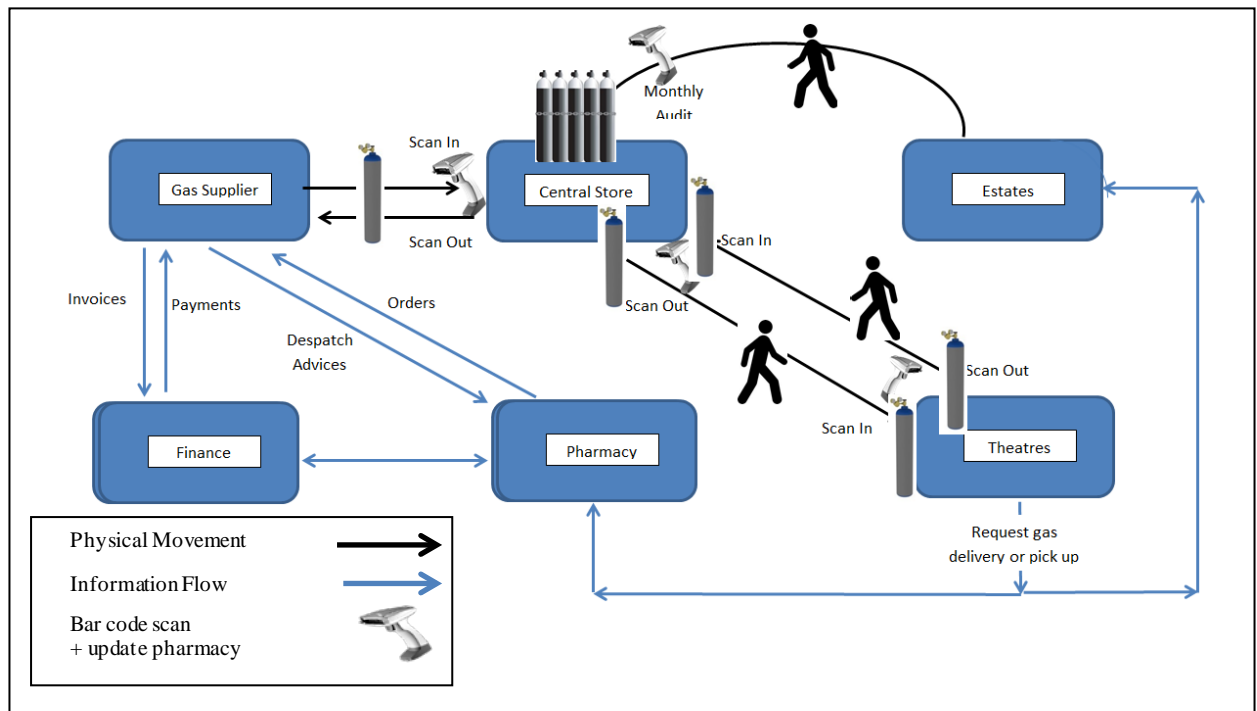


Figure 1

8.1. Prerequisites

Gas Supplier

The gas supplier should identify each cylinder and valve combination with a GS1 Global Returnable Asset Identifier encoded in a GS1 compliant bar code and/or RFID tag. If the cylinder body/valve combination changes then a new GRAI should be created.

The gas product should be identified by a Global Trade Item Number (GTIN) which should also be encoded in a GS1 compliant bar code.

The gas supplier should also be able to process electronic orders, invoices and despatch advice using either GS1 XML or GS1 EANCOM standards.

Trust

Each location where gas is stored should be identified by a GS1 Global Location Number (GLN). This GLN should be encoded in a GS1 compliant bar code attached to the location.

Staff involved in the movement of cylinders should have the use of a hand-held device capable of reading GS1 Compliant bar codes and able to upload and download information into an IT system that records information about the movement of gas cylinders and checks this against invoices received. This system should be integrated into the trust's procurement and inventory management systems.

The trust should be able to process GS1 compliant electronic messages for orders, invoices and despatch advice

8.2. Orders

In the traditional order process the trust creates an order which is sent to the gas supplier electronically using either the GS1 XML or the GS1 EANCOM EDI standard. In the vendor managed process orders will only be sent in exceptional circumstances. The products ordered should be identified by a GS1 Global Trade Item Number (GTIN); the ship to delivery location and the bill to organisation should be identified by GLNs.

Order

The trust orders should be sent as a GS1 compliant electronic message including the following information

- Bill to ID (GLN) – defines where invoices should be sent
- Ship to ID (GLN) – defines where the physical product should be delivered
- The supplier ID (GLN) – defines to which supplier the order is being sent
- The gas ID (GTIN) – defines the type and quantity of gas required

The gas supplier may send a confirmation that the order can be filled or it may be assumed that all orders will be filled unless notification is received by the supplier.

8.3. Receipt from Supplier

The supplier will deliver gas cylinders to the secure cylinder store. The supplier may be given access to the store so that trust staff do not have to be present. The supplier scans the cylinders that are being delivered to record their unique GRAI identifiers and also scans the GLN bar code of the delivery location for inclusion in a subsequent electronic despatch advice, (Note that the despatch advice cannot be sent in advance since it is not known in advance which specific serialised cylinders have been off loaded to the store)

The trust may also scan the GRAI bar codes on the cylinders, and the store location if the trust has more than one, for future checking against the suppliers electronic despatch advice. However trusts may not do this because of the difficulty in arranging for staff to be present during supplier deliveries.

Despatch Advice

The supplier despatch advice should be GS1 compliant electronic message including the following information for each cylinder delivered

- The GRAI of the cylinder
- The GTIN of the gas product
- The lot number of the gas
- The expiry date of the gas
- The date/time of the delivery
- The GLN of the location delivered to

8.4. Delivery from store to trust theatres

When a theatre's stock of gas drops below a predefined level, an electronic work order should be sent to the hospital porters to deliver additional gas cylinders. The work order should include the GTIN of the gas required and the GLN of the location to which it should be delivered

The porter should collect the ordered gas cylinders from the cylinder store and scan them to check that the correct cylinders have been collected. The porter should then take the cylinders to the theatre, scan them again and also scan the GLN bar code of the department to record which cylinders were delivered and to which location.

8.5. Allocation to Patients

If a patient with a gas cylinder is moved out of the department then the patient wrist band and the gas cylinder GRAI should be scanned and recorded. In this way knowledge of the patient's location, through bed management or other system, will determine the location of the cylinder itself.

8.6. Collection from trust departments to store

Collection of empty cylinders can be requested by the department or can be done routinely as porters deliver full cylinders. In either case the porter should scan the location bar code (GLN) and the cylinder bar codes (GRAI) to record what has been collected. He should then take the cylinders to the store and scan the cylinder bar codes and the location code of the store.

8.7. Supplier collection from store

The supplier will collect the cylinders from the central store either on request or when delivering the next batch of full cylinders.

8.8. Monthly cylinder audit

Once the gas cylinder supplier invoice has been received the trust should scan all the cylinders in the store. This ensures that all cylinders that have been delivered over the last month have been scanned and recorded. (Note this is not necessary if cylinders are scanned and recorded on each delivery)

8.9. Invoicing and Payment

The supplier should provide a GS1 compliant electronic invoice for the gas provided including the following information for each cylinder

- The GRAI of the cylinder
- The GTIN of the gas contained
- The date/time of the delivery
- The GLN of the location delivered to

The supplier should also provide a GS1 compliant electronic invoice for each cylinder on rental including the following information for each cylinder:

- The GRAI of the cylinder
- The GTIN of the gas contained
- The GTIN for the different gas cylinder rental service
- The date and time when it was delivered
- The date and time when it was collected.
- The GLN of the location delivered to

8.10. Minimising gas and cylinder rental costs

The information collected through the bar code scans and the electronic messages described in the previous sections enables the following

- Check that the supplier's invoices for gas are correct
- Check that the supplier's invoices for cylinder rental are correct
- Set the inventory replenishment levels for gas correctly based on current usage
- Highlight any cylinders on rent for longer than expected so that appropriate action can be taken

- Highlight any cylinders that have left the trust with patients so that appropriate action can be taken
- Highlight any departments where cylinders are “lost” so that appropriate action can be taken
- Highlight any cylinders returned to the central store that the supplier did not deliver to the trust so that appropriate action can be taken.
- Allocate gas costs accurately to different departments

9. Creating GS1 Identifiers and Labels.

Clearly it is essential that the trust should ensure that there is no duplication in the creation of GS1 identifiers. This will require the trust to put in place a governance process for the creation of GS1 identifiers. (See GS1 UK paper “GS1 Company Prefix Governance”)

GS1 DataMatrix bar codes can be very small depending on the level of error correction required; this makes them suitable for marking small assets, although the human readable information on the asset label may limit how small the label can be. Note however that image based scanners are required to scan GS1 DataMatrix bar codes.

Care should be taken to ensure that any labels meet the requirements of infection control.

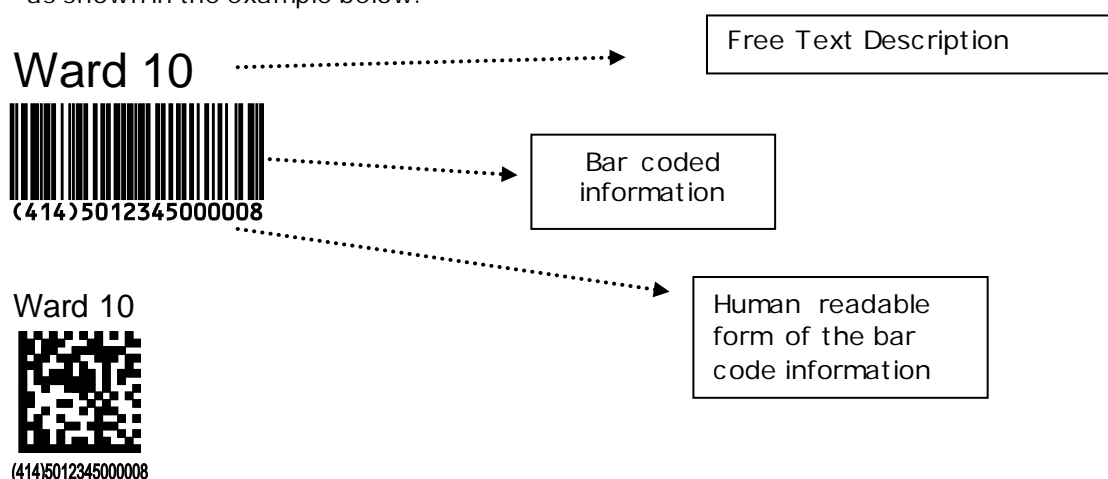
9.1. Creating GLNs

GS1 GLNs consist of 13 numeric digits including a check digit. Assuming that the trust has been allocated an 8 digit GS1 company prefix this allows for 10,000 unique locations to be identified. GS1 UK can allocate additional company prefixes if more location identifiers are required.

Alternatively GS1 standards also support a 20 character alphanumeric GLN extension component which substantially increases the number of locations that can be identified with a single GS1 prefix. However the use of the GLN extension is restricted to internal use and GS1 UK recommends that it is not used unless there are special reasons for doing so.

9.2. Physical Location Labels

The GLN bar code label can include a human readable free text description of the location if required as shown in the example below.



The GS1 UK web site provides a Numberbank function where GLNs can be created and linked to a description. This ensures that GLNs are formed correctly including the necessary check digit. A bulk up and download facility is available making it easy to integrate GLNs into the trust’s internal systems. For more information email healthcare@gs1uk.org or phone 0808 1728390.

The GS1 GLN in Healthcare Implementation Guide (see www.gs1uk.org) and the GLN Allocation Rules (<http://www.gs1.org/1/glnrules/>) provides more information about the use of GLNs.

9.3. Interpreting GRAI labels

The GRAIs for the cylinders should be created by the gas supplier. The gas supplier will need their own GS1 company prefix which they can obtain by becoming a GS1 UK member. Suppliers who are unfamiliar with GS1 should contact GS1 UK on 0808 1728390 or by email at healthcare@gs1uk.org.

A GRAI consists of 13 numeric digits, including a final check digit, followed by a serial number of up to 18 alpha-numeric characters. In bar codes the GRAI is preceded its Application identifier (AI) number which is 8003. The example below shows a GRAI of 00614141123452 with optional serial number of 54321.



(8003) 00614141123452543210

10. Getting Started

- Discuss requirements with current gas supplier. Bar coded gas cylinders are essential.
- Find out more about GS1 standards and who else is implementing them within your trust by contacting GS1 UK on 0808 1728390 or healthcare@gs1uk.org
- Visit other trusts who have implemented improved systems got gas cylinder management
- Assess current performance
 - % of cylinders on rental but not found
 - Current stock turn (annual cost of gas divided by the average cost of all gas cylinders on site in the trust)
- Identify a senior management sponsor and build a business case based on the benefits in section 3
- Review how gas cylinder management can be incorporated into any eProcurement and inventory management initiatives that the trust may have as a response to the DH eProcurement strategy.
- Agree a phased implementation plan
- Identify a suitable solution partner with experience of GS1 standards to source bar code printers, labels and scanners
- Allocate GLNs to relevant locations
 - Contact GS1 UK to find the trust's GS1 company prefix and who is responsible for its use
 - Discuss with estates and any others within the trust who are already using GLNs or are planning to do so.
 - Work with solution provider to decide on the form and layout for GLN labels.
 - Send example GLN label to GS1 UK for confirmation of the format and readability of the label
 - Work with estates to attach the labels to suitable positions in the relevant trust locations

11. Appendix 1 – BOC Cylinders

11.1. BOC Bar Codes

BOC cylinders carry bar codes which largely conform to the processes described in this guideline. However there is some ambiguity in the way that the GS1 standards have been interpreted. This section clarifies how to interpret the BOC bar codes.



Figure 2 BOC Cylinder bar code label

BOC cylinders currently carry the following bar codes as shown in Figure 2 BOC Cylinder bar code label

- EAN 13 bar code encoding 5015573101943, the Global Trade Item Number (GTIN) of the gas in the cylinder
- A GS1 128 bar code encoding 21101944774824. The 21 is an Application Identifier (AI) which shows that what follows is a serial number. (Ideally the 21 should be shown in brackets in the human readable text to distinguish it from the serial number itself.)

This is not GS1 compliant since when a serial number is linked to a GTIN it relates to the specific instance of the product, in this case the specific batch of gas in the cylinder rather than to the cylinder itself. However it does make use of elements of the GS1 standards. The following work around is recommended (to be agreed with BOC).

Both bar codes should be scanned, if an EAN 13 is read with the first digits 5015573 (the BOC prefix) then this should be treated as a BOC product and applications should interpret the GTIN in the EAN 13 as a GRAI without the optional serial number. The serial number in the GS1 128 should be interpreted as the optional GRAI serial number.

The following example illustrates

A BOC cylinder with the following bar codes

EAN 13 5015573101943

GS1 128 21101944774824

The scans from these bar codes should be translated into

a GRAI of 5015573101943101944774824 and a GTIN of 5015573101943

GS1 UK and BOC are working together to make their systems fully compliant with GS1 standards.

11.2. Other Suppliers

At the current time it is not clear which other suppliers provide bar codes on their cylinders. If a gas cylinder supplier does not bar code their cylinders with GS1 compliant bar codes as described above then these guidelines cannot be followed. GS1 UK would be pleased to discuss with suppliers how they could add suitable GS1 bar codes to their products.

12. Appendix 2 – GS1 standards

GS1 keys identify entities in a wide variety of industry sectors including healthcare. These keys all start with a sequence of numeric digits, called the GS1 Company Prefix (GCP), which GS1 Member Organisations (MOs) license to individual companies. Subsequent digits or characters are appended to the prefix to create unique identifiers for specific items.

When a key is encoded in a GS1 bar code it is prefixed by an Application Identifier (AI) number which identifies the key. The information in a GS1 bar code is also printed in human readable form adjacent to the bar code. The Application Identifier is enclosed in parentheses in the human readable form but the brackets are not encoded in the bar code itself.

More detailed information on all GS1 keys and bar codes is available at http://www.gs1.org/barcodes/technical/id_keys

The complete GS1 identification and bar code standards are documented in the GS1 General Specifications available at <http://www.gs1.org/genspecs>.

12.1. GS1 Keys for Gas Management

The most common keys are summarised below.

12.1.1. GIAI – Global Individual Asset Identifier

The GIAI can be used to identify any asset including such things as, computers, vehicles, surgical instruments, pumps and specimens.

12.1.2. GLN – Global Location Number

The GLN can be used to identify physical locations and organisation entities where is a need to retrieve pre-defined information to improve the efficiency of communication with the supply-chain. Global Location Numbers are a prerequisite for GS1 eCom messages.

GLNs can have an additional extension component to identify sub locations.

12.1.3. GSRN – Global Service Relation Number

The Global Service Relation Number (GSRN) can be used to identify the provider or recipient of a service. In the NHS the GSRN is used on the patient wrist band to identify patients and may also be used to identify healthcare professionals.

12.1.4. SSCC – Serial Shipping Container Code

The SSCC can be used to identify an item of any composition established for transport and/or storage which needs to be managed through the supply chain. The SSCC is assigned for the life time of the transport item and is a mandatory element on the GS1 Logistic Label. SSCCs are used to identify the payload on a pallet, in a roll cage or in a package.

12.1.5. GTIN – Global Trade Item Number

The GTIN is the GS1 Identification Key for any item (product or service) that may be priced, or ordered, or invoiced at any point in any supply chain. The GTIN is then used to retrieve pre-defined information about the item. The key benefit is that information about the item can be retrieved whether it is read in a GS1 bar code symbol, exchanged via a GS1 eCom message or accessed from the Global Data Synchronisation Network.

12.1.6. Global Returnable Asset Identifier - GRAI

The GRAI is used to identify returnable items such as pallet bases, roll cages, plastic containers or gas cylinders which are used in the movement of goods. The goods themselves are identified by a GTIN or an SSCC.

The GRAI is constructed as follows:

GS1 Company Prefix > < Asset Reference													Check Digit	Serial Number (optional)
0	N ₁	N ₂	N ₃	N ₄	N ₅	N ₆	N ₇	N ₈	N ₉	N ₁₀	N ₁₁	N ₁₂	N ₁₃	X ₁ variable X ₁₆

12.1.7. GDTI – Global Document Type Identifier

The GDTI is the Identification Key for a document type, for example a form, a certificate or a warranty. It can be combined with an optional, alpha-numeric serial number to identify specific instances of a document type.

12.2. GS1 Bar Codes

When GS1 keys and attributes are encoded into GS1 bar codes they are preceded by codes, known as Application Identifiers. For example GIAIs are preceded by AI 8004 while a GLN for a physical location is preceded by AI 414. The standard for GS1 bar codes is that the data encoded in the bar code should also be shown in human readable form. For readability AIs are enclosed in brackets in the human readable text although the brackets are not contained in the bar code itself.

The bar codes likely to be used in asset management are either GS1 128 or GS1 DataMatrix

Examples are shown below.

12.2.1. GS1 128

This bar code can be read by virtually any bar code scanning device. The data structure in the bar code is defined to enable batch numbers, expiry dates and a wide range of other information to be included.

GS1 128 bar code is a relatively large image the size of which varies with the information it contains. The example shows a GS1 128 bar code containing a GIAI.



12.2.2. GS1 DataMatrix

The GS1 DataMatrix bar code can carry more information than the GS1 128 bar code in a much smaller space; it can also be read even when the bar code image has been damaged in some way assuming that the optional error correction capability has been used. However GS1 DataMatrix requires a camera scanner, such as those in mobile phones. GS1 DataMatrix cannot be read by the laser scanners which may already be deployed in some departments.

Again the size of a GS1 DataMatrix bar code will vary with the information it contains the level of error correction used. The example shows a GS1 DataMatrix containing a GIAI.



(8004)5012345000008

12.3. Information Exchange

GS1 standards for the exchange of electronic messages cover a wide range of business transactions including orders, invoices and despatch advice. The messages may be in GS1 XML or EANCOM (a subset of ISO EDIFACT) format. Detailed information is available at <http://www.gs1.org/ecom>.

13. References

Department of Health Medical gases Health Technical Memorandum

02-01: Medical gas pipeline systems

Part B: Operational management

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/153576/HTM_02-01_Part_B.pdf

Coding for Success

http://webarchive.nationalarchives.gov.uk/20080814090248/dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_066082

GS1 Company Prefix Governance GS1 UK Paper for HSCIC

On request from GS1 UK

GS1 DataMatrix

http://www.gs1.org/docs/barcodes/GS1_DataMatrix_Introduction_and_technical_overview.pdf

GS1 General Specifications

www.gs1.org/genspecs

GS1 Healthcare User

Group http://www.gs1.org/docs/healthcare/GS1_HUG_ps_Camera_Based_Scanners.pdf

ISB 0108 AIDC: Automatic Identification and Data Capture

<http://www.isb.nhs.uk/library/standard/196>

ISB 1077 AIDC for Patient Identification

<http://www.isb.nhs.uk/documents/isb-1077>

The GS1 GLN Allocation Rules

<http://www.gs1.org/1/glnrules/>

The GS1 GLN in Healthcare Implementation

Guide http://www.gs1.org/docs/gsmf/healthcare/GLN_Healthcare_Imp_Guide.pdf

Recommendations on the use of GLNs in NHS Trusts GS1 UK Paper for HSCIC

On request from GS1 UK