



The Global Language of Business

Supporting Verification of Patient Identification Implementation Guideline

Release 1.0, Ratified, Sep 2026

Document Summary

Document Item	Current Value
Document Name	Supporting Verification of Patient Identification Implementation Guideline
Document Date	Sep 2026
Document Version	1.0
Document Issue	
Document Status	Ratified
Document Description	

Contributors

Name	Organisation
Pascal Aulagnet	Pfizer
Chiara Bernini	GS1 Global Office
Margarita Bykova	GS1 Russia
Marjolein Christiaanse	GS1 Netherlands
Wladislaw Chudinovskykh	GS1 Germany
Claire Clarke	GS1 Global Office
Danny Cowley	Dedalus
Amanda Creane	GS1 Ireland
Oscar Cruz	GS1 Mexico
Karina Danielsson	GS1 Sweden
Peta Ding	GS1 Global Office
Fadi El-Turk	GS1 UK
Kay Fazackerley	Dedalus
Axel Fengler	Medilox GmbH
Marie Friederich	F. Hoffmann-La Roche Ltd.
Nigel Fuller (co-chair)	GS1 Australia
Amrit Garg	AIDC Solutions and Research Foundation
Stefan Gathmann	GS1 Ireland
Sébastien Germain	GS1 Global Office
Nicole Golestani	GS1 Canada
Jo Goulding	NHS England
Heinz Graf	GS1 Switzerland
Nadi (Scott) Gray	GS1 Global Office
Michaela Hähn	GS1 Germany
Lindsay Hillman	GS1 US
Christine Horvath-Hanko	GS1 Hungary
Jingyu Hou	GS1 China
Han Jie	GS1 China

Name	Organisation
Martin Kairu	GS1 South Africa
Gordana Kalan	CRYSTAL, Medical Center Ltd
Iliada Karali	GS1 Association Greece
Steven Keddie	GS1 Global Office
Catherine Koetz	Australian Digital Health Agency
Bojan Kovacic	GS1 Slovenia
Katharina Lang	GS1 Germany
Jenny Langton	GS1 New Zealand
Georgina Lawton	GS1 UK
Nicolas Liou	GS1 Chinese Taipei
Marisa Lu	GS1 Chinese Taipei
Yan Luo	GS1 China
Ryan Mavin	ACT Health
Tracy McClelland	Dedalus
Riad Mechtari	GS1 Algeria
Joan Melendez	Xcelrate UDI
Holly Mitchell	Seagull Scientific
Andrew Morehead	GS1 US
Giada Necci	GS1 Italy
Georges Nicolaos	Hospital Fondation Adolphe de Rothschild
Michael Nolan	Automatic Identification Systems, Inc. (AIS)
Tunde Odunlami	GS1 Nigeria
hirra oppal	GS1 UK
Miquel Pascual	GS1 Spain
Roger Peterson	Arthrex Inc.
Neil Piper (lead editor)	GS1 Global Office
John Pitts	Antares Vision
Aruna Ravikumar	GS1 Australia
Sylvia Reingardt	GS1 Germany
Hajo Reissmann	Hajo Reissmann Consulting
Craig Alan Repec	GS1 Global Office
Mohamed Riaz	Solventum (previously 3M Healthcare)
Greg Rowe (facilitator)	GS1 Global Office
Liu Ruizhi	GS1 China
Sue Schmid	GS1 Global Office
Ghada Shakir	GS1 Egypt
Steven Simske	Colorado State University
Mark Songhurst (co-chair)	The Leeds Teaching Hospitals NHS Trust
Roko Stanicic	GS1 Slovenia
Sylvia Stein	GS1 Netherlands
Lena Steinmetz	GS1 Germany

Name	Organisation
Jon Tang	Sydney Local Health District
Claude Tetelin	GS1 Global Office
Chris Tetley	Dedalus
Alec Tubridy	GS1 Australia
Kate Turner (co-chair)	Dedalus
Anne van Berkel Meier	GS1 Switzerland
Ricardo Verza Amaral Melo	GS1 Brasil
Elizabeth Waldorf	TraceLink
Chunguang Wang	GS1 China
Di Wang	GS1 China
Lei Wang	GS1 China
Jiayi Wang	GS1 China
Wenyu Wang	GS1 China
Ethan Ward	GS1 Australia
Geoff Warrington	GHX UK Ltd
Beth Wells	GS1 US
Kevin Wu	Creative Sensor Inc.
Huang Xin	GS1 China
Ruoyun Yan	GS1 China
Xin Yang	GS1 China
Xie Yi	GS1 China
Bo Zhou	GS1 China

Log of Changes

Release	Date of Change	Changed By	Summary of Change
1.0	Sep 2026	Neil Piper	Initial Publication based on GSMP Work Request 25-017

Disclaimer

GS1 seeks to minimise barriers to the adoption of its standards and guidelines by making the intellectual property required to implement them available, to the greatest extent possible, on a royalty-free basis, or when necessary, under a RAND licence. Such royalty-free and RAND licences are provided pursuant to the GS1 IP Policy (available here: <https://www.gs1.org/standards/ip>), which governs the work of work group participants who contribute to drafting standards and guidelines, including this document. In addition to licences, the GS1 IP Policy provides various benefits and obligations that apply to all implementers of GS1 standards and guidelines, and all implementations of GS1 standards are subject to those terms.

Nevertheless, please note the possibility that an implementation of one or more features of this standard or guideline may be the subject of a patent or other intellectual property right that is not covered by the licences granted pursuant to the IP Policy. In addition, the licences granted under the IP Policy do not include the IP rights or claims of third parties who were not participants in the corresponding standard development work group.

Accordingly, GS1 recommends that any person or organisation developing an implementation of this standard or guideline should determine whether any patents or other intellectual property may encompass such implementation, and whether a licence under a patent or other IP right is needed. The implementer should determine the potential need for licensing in view of the details of the specific implementation being designed in consultation with that party's patent counsel.



The official versions of all GS1 standards and guidelines are provided as PDF files on GS1's online reference directory (<https://ref.gs1.org>) (the "GS1 Reference"). Any other representations of standards or guidelines in any other format (e.g., web pages) are provided for convenience and descriptive purposes only, and in the event of a conflict, the GS1 Reference document shall govern.

THIS DOCUMENT IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR PARTICULAR PURPOSE, ACCURACY OR COMPLETENESS, OR ANY WARRANTY OTHERWISE ARISING OUT OF THIS DOCUMENT. GS1 disclaims all liability for any damages arising from any use or misuse of this document, whether special, indirect, consequential, or compensatory damages, and including liability for infringement of any intellectual property rights, relating to use of information in or reliance upon this document.

GS1 makes no commitment to update the information contained herein, and retains the right to make changes to this document at any time, without notice. GS1® and the GS1 logo are registered trademarks of GS1 AISBL.

Table of Contents

1	Executive Summary	8
1.1	About this document	8
2	Background	10
2.1	Scope	10
3	Terms, definitions, and abbreviations.....	11
3.1	Terms and definitions (Glossary).....	11
3.2	Abbreviated terms.....	12
4	Additional Resources	13
5	Patient Identification Use Cases	14
5.1	Admission Process – UC01.....	14
5.2	At the care unit – UC02	15
5.3	Surgical Operation – UC03	16
5.4	Discharge – UC04	18
6	Global Service Relation Number (GSRN) – Overview	20
6.1	Why the GSRN is essential for the validation and verification of the “subject of care”.....	20
6.2	GSRN and associated data elements.....	20
6.3	GS1 Application Identifiers definitions.....	21
6.3.1	Introduction	21
6.3.2	GS1 Application Identifiers in numerical order	21
6.3.3	AIDC media type: AI (7241)	22
6.3.4	Version Control Number (VCN): AI (7242)	23
6.3.5	Date of birth: AI (7250).....	23
6.3.6	Date and time of birth: AI (7251)	23
6.3.7	Biological sex: AI (7252)	24
6.3.8	Family name of person: AI (7253)	24
6.3.9	Given name of person: AI (7254)	24
6.3.10	Name suffix of person: AI (7255).....	24
6.3.11	Full name of person: AI (7256).....	24
6.3.12	Address of person: AI (7257)	25
6.3.13	Baby birth sequence indicator: AI (7258).....	25
6.3.14	Baby of family name: AI (7259)	25
6.3.15	Global Service Relation Number (GSRN) to identify the relationship between an organisation offering services and the recipient of services: AI (8018).....	25
6.3.16	Service Relation Instance Number (SRIN): AI (8019)	26
6.3.17	Company and internal information: AIs (91 – 99)	26
6.4	Standard check digit calculations for GS1 data structures.....	26
6.5	Company Internal Information: AIs (91 to 99) – Existing Use and migrating to GS1 Application Identifiers.....	26
7	Barcoding the GSRN.....	28
7.1	GSRN barcode environment use	28
7.1.1	Digital	28
7.1.2	Physical	28



7.1.3	Choose the right barcode.....	28
7.1.4	Compliant barcodes	28
7.1.5	Placement and duplicate barcodes	28
	Patient identification barcodes can be used on various printed media, the most commonly used are on patient wristbands, patient identity bands and patient identification cards.	28
7.1.6	Human readable text.....	29
7.1.7	Addressing the support for special characters.....	29
7.2	Printing, reading and processing the GS1 DataMatrix barcode.....	31
7.2.1	GS1 Barcode Syntax Resource.....	31
7.2.2	Reading (scanning)	32
7.2.3	Receiving systems	32
7.2.4	Stakeholders' roles and responsibilities.....	33
7.3	GS1 Compliant GS1 DataMatrix barcodes.....	34
7.3.1	Barcode Quality	34
7.3.2	GS1 DataMatrix barcode creation considerations.....	37
7.4	Printing.....	37
7.4.1	The major printer technologies used in patient identification	37
7.4.2	GS1 DataMatrix barcode printing considerations	37
7.5	Scanning.....	37
7.6	Verification.....	38
7.6.1	Barcode verifier considerations for GS1 DataMatrix use in healthcare	38
8	Appendix	40
8.1	Patient wristband examples from existing implementations	40
8.2	GS1 barcode examples using existing GS1 Application Identifiers.....	41
9	Reference Material.....	43

1 Executive Summary

This document “**Supporting Verification of Patient Identification Implementation Guideline**” aims to provide guidance and support to all stakeholders wishing to implement GS1 standards relevant to the validation and verification of the Subject of Care (SoC) also referred to as the patient. It is focused on the considerations and implications of utilising the GS1 DataMatrix barcode encoding the GS1 identifiers Global Service Relation Number (GSRN) and Service Relation Instance Number (SRIN) as well as their associated GS1 informative data (as listed below), for use by healthcare stakeholders inc. hospital staff, solution providers, regulatory bodies etc.

- Global Service Relation Number (GSRN) for “Recipient”
- Service Relation Instance Number (SRIN)
- Version Control Number (VCN)
- AIDC Media Type Identifier
- The suite of “*patient demographic*” data elements

The identifiers GSRN, SRIN and their associated informative data listed above, support the “*Verification of Patient Identification*” for use on patient wristbands, patient identity bands, patient identification cards, within healthcare digital apps used on a mobile device and other appropriate healthcare documentation where patient identification is required.

! Important Patient Privacy Note: As GS1 does not allocate a globally unique identifier for patients and no patient or caregiver data is stored and maintained by GS1, patient and caregiver identification and privacy responsibility remains with the organisation delivering the care and identifying the relationship between its care providers and patients.

1.1 About this document

This is a practical implementation guideline for all stakeholders from the healthcare ecosystem to understand the requirements for adopting GS1 standards for “**Supporting Verification of Patient Identification**”. This document along with the GS1 AIDC Application Standard “Supporting the verification or validation of a subject of care (patient) – Section 2.5.4 of the GS1 General Specifications” as detailed in Section 10 details the normative standards that serve as the foundation for this guideline.

All barcode examples in this document are not of actual size and are shown for illustrative purposes only. Appendix Section 8 provides examples of barcodes to demonstrate technical requirements, with respects to size and scale, however the GS1 Symbol Specifications Tables defined by the GS1 General Specifications SHALL be used for all normative references to ensure conformance requirements are met when producing barcodes on physical labels

All readers are advised to read the document in its entirety, however section 4 for general guidance and then specific sections as detailed below based on your job function / role .

New GS1 standards users:

If GS1 standards are new to your organisation please contact your local GS1 Member Organisation (www.gs1.org/contact).

Health IT Systems Providers

For all providers of clinical informatics systems - integrated, end-to-end solutions from master data management of medical devices, medications, healthcare professionals and patients throughout to billing with health insurance companies.

Read Sections 4,6,7 and 8 for requirements to implement the GSRN, GS1 Application Identifiers, GS1 barcode syntaxes and the GS1 DataMatrix barcode for use on a patient wristband, patient

identity band, patient identity card etc. and requirements to implement barcode printing and scanning according to the regulations and the needs within the hospital.

Healthcare Providers

- Providers of Care - Healthcare professionals such as doctors, pharmacists, and carers
- IT Departments

Read Sections 4,5 and 6 for requirements to implement the GSRN, GS1 Application Identifiers, GS1 barcode syntaxes and the GS1 DataMatrix barcode for use on a patient wristband, patient identity band, patient identity card etc. and requirements to implement barcode printing and scanning according to the regulations and the needs within the hospital.

AIDC equipment and software companies:

With requirements to implement barcode printing and scanning according to the regulations and the needs within the hospital.

Read Sections 4,6,7 and 8 for requirements to implement the GSRN, GS1 Application Identifiers, GS1 barcode syntaxes and the GS1 DataMatrix barcode for use on a patient wristband, patient identity band, patient identity card etc. and requirements to implement barcode printing and scanning according to the regulations and the needs within the hospital.

Providers of software solutions at the point of care

IT applications to support medication at the bedside.

Read Sections 4,6,7 and 8 for requirements to implement the GSRN, GS1 Application Identifiers, GS1 barcode syntaxes and the GS1 DataMatrix barcode for use on a patient wristband, patient identity band, patient identity card etc. and requirements to implement barcode printing and scanning according to the regulations and the needs within the hospital.

Providers of clinical informatics systems

Integrated, end-to-end solutions from master data management of medical devices, medications, healthcare professionals and patients throughout to billing with health insurance companies.

Read Sections 4,6,7 and 8 for requirements to implement the GSRN, GS1 Application Identifiers, GS1 barcode syntaxes and the GS1 DataMatrix barcode for use on a patient wristband, patient identity band, patient identity card etc. and requirements to implement barcode printing and scanning according to the regulations and the needs within the hospital.

2 Background

“*Supporting Verification of Patient Identification*” is extremely important in all care environments, this term is often referred to as “*positive patient identification*” which helps prevent medical errors, including medication errors, blood transfusion errors, wrong person procedures, it also contributes to better patient experiences by streamlining interactions and improving patient satisfaction.

With the advent and adoption of the GS1 DataMatrix barcode for “*Supporting Verification of Patient Identification*” it is important that care environments migrate from multiple linear barcodes using proprietary data sets to a single GS1 DataMatrix barcode allowing for consistent data structures and data “concatenation”.

2.1 Scope

In Scope	Out of Scope
- Guidance for healthcare implementors, procurement professionals, patient safety groups, and solution providers. - Guidance on migration from non GS1 standards use to GS1 standards compliance where possible. - Guidance on the use of GS1 identifiers supporting the verification of patient identification. - Guidance on how to use the GS1 DataMatrix barcode, its placement (barcode replication), the use of HRI and non-HRI information. - GS1 DataMatrix barcode printing including barcode quality, reading (scanning) and processing considerations for patient identification. - Guidance on GS1 identifiers being used on the following “printed output” or “digital display”: - Patient wristband - Patient identity band - Patient identity card - Healthcare digital app used on a mobile device. - Other appropriate healthcare documentation where patient identification is required.	- Guidance on Radio Frequency Identification (RFID) usage for patient identification (see EPC/RFID standards for more information) - Guidance to meet the requirements of specific existing local regulations e.g. Compliance with DCB 1077 in England. - Data sharing methods (e.g., master data, event data, transactional data, web standard) - Provider of Care (Caregiver) identification using the GSRN GS1 Application Identifier (8017) and GS1 standards. - The use of non-GS1 legacy barcodes

3 Terms, definitions, and abbreviations

3.1 Terms and definitions (Glossary)

Please refer to the <https://xchange.gs1.org/sites/glossary/> for the latest version.

Table 3-1 Key terms and definitions utilised in this document

Term	Acronym/ Abbreviation	Definition
automatic identification and data capture	AIDC	A technology used to automatically capture data. AIDC technologies include barcodes, smart cards, biometrics and RFID.
AIDC media type		The code list for objects/entities (e.g., patient wristband or staff ID card) that displays or carries a GS1 AIDC data carrier.
caregiver		Is the Individual Provider, any person who provides or is a potential provider of a Healthcare service.
concatenation		The representation of several element strings in one barcode.
check digit		Numeric character calculated from data and appended as part of the data string to ensure that the data is correctly composed and transmitted.
Global Service Relation Number	GSRN	The GS1 identification key used to identify the relationship between an organisation offering services and the recipient or provider of services. The key comprises a GS1 Company Prefix, service reference and check digit.
GS1 Application Identifier	AI	The field of two or more digits at the beginning of an element string that uniquely defines its format and meaning.
GS1 check digit calculation		An algorithm used by the GS1 system for the calculation of a check digit to verify accuracy of data. (e.g., modulo 10 check digit, price check digit).
GS1 DataMatrix		A subset of Data Matrix which uses the function that allows the encoding of element strings.
GS1 element string		A syntax for expressing GS1 identifier keys and attributes in a format using GS1 Application Identifiers and GS1 Application Identifier data fields.
healthcare provider		An organisation or facility that delivers healthcare to a subject of care. Corresponds to "care delivery organisation", "healthcare organisation", etc.
human readable interpretation	HRI	Characters, such as letters and numbers, which can be read by persons and are encoded in GS1 AIDC data carriers confined to a GS1 standard structure and format. The human readable interpretation is the encoded data. Start, stop, shift and function characters, as well as the symbol check character, are not shown in the human readable interpretation.
human readable text		Refers to HRI and/or non-HRI text collectively, when referencing data that is encoded into a data carrier.
non-human readable interpretation text	non-HRI	Characters such as letters and numbers that can be read by persons and may or may not be encoded in GS1 AIDC data carriers and are not confined to a structure and format based on GS1 standards (e.g., a date code expressed in a national format that could be used to encode a date field in a GS1 AIDC data carrier, brand owner name, consumer declarations).

Term	Acronym/ Abbreviation	Definition
Patient		Is the Subject of Care (SoC), any person who uses, or is a potential user of, a healthcare service. A patient may also be known as a healthcare consumer.
Patient identification card		Also referred as an "identity" card. A printed card that includes information that allows a "provider of care" supporting the verification of patient identification, and used when a patient wristband is not present.
service relation instance number	SRIN	An attribute to the GSRN which allows to distinguish different encounters during a service relationship.
subject of care		Any person who uses or is a potential user of a healthcare service, subjects of care may also be referred to as patients or healthcare consumers.
verifier		In the context of barcoding and quality control, refers to a measuring device used to analyse various aspects of barcode quality according to industry standards and specifications. This is often known as a barcode verifier.
Version Control Number	VCN	A GS1 identification key attribute to facilitate version control, where differentiation is required for multiple occurrences of the same identification used on the same AIDC media type. For example, to ensure only the latest occurrence of access controlled AIDC media is valid upon scanning, where multiple occurrences could present risks (e.g., lost ID badge).
wristband		An identification band that includes printed information including a GS1 DataMatrix barcode and patient information supporting the verification of patient identification. A wristband is also sometimes referred to as an "Identity band", "Hospital ID band", "Patient identification band" or "Patient ID wristband" etc.

3.2 Abbreviated terms

Table 3-2 Abbreviations utilised in this document

Abbreviation	Term
AI	GS1 Application Identifier
AIDC	Automatic identification and data capture
CSN	Contact Serial Number
DOB	Date of birth
FNC1	Function 1 Symbol Character
GCP	GS1 Company Prefix
GSRN	Global Service Relation Number
HRI	Human readable interpretation
SRIN	service relation instance number
SoC	Subject of Care

4 Additional Resources

This section provides general information to all healthcare stakeholders on the implementation of the GS1 DataMatrix barcode. Before implementation, it's highly recommended to gain an initial understanding of the GS1 standards especially those related to the Global Service Relation Number (GSRN) identification and data capture by engaging with/contacting the local GS1 Member Organisation (www.gs1.org/contact).

For further -details/information on GS1 standards, see:

[Global Service Relation Number - Overview](#)

[GS1 DataMatrix Guideline](#)

[GS1 two-dimensional \(2D\) barcodes](#)

[2D Barcode Verification Process Implementation Guideline](#)

[GS1 General Specifications](#)

5 Patient Identification Use Cases

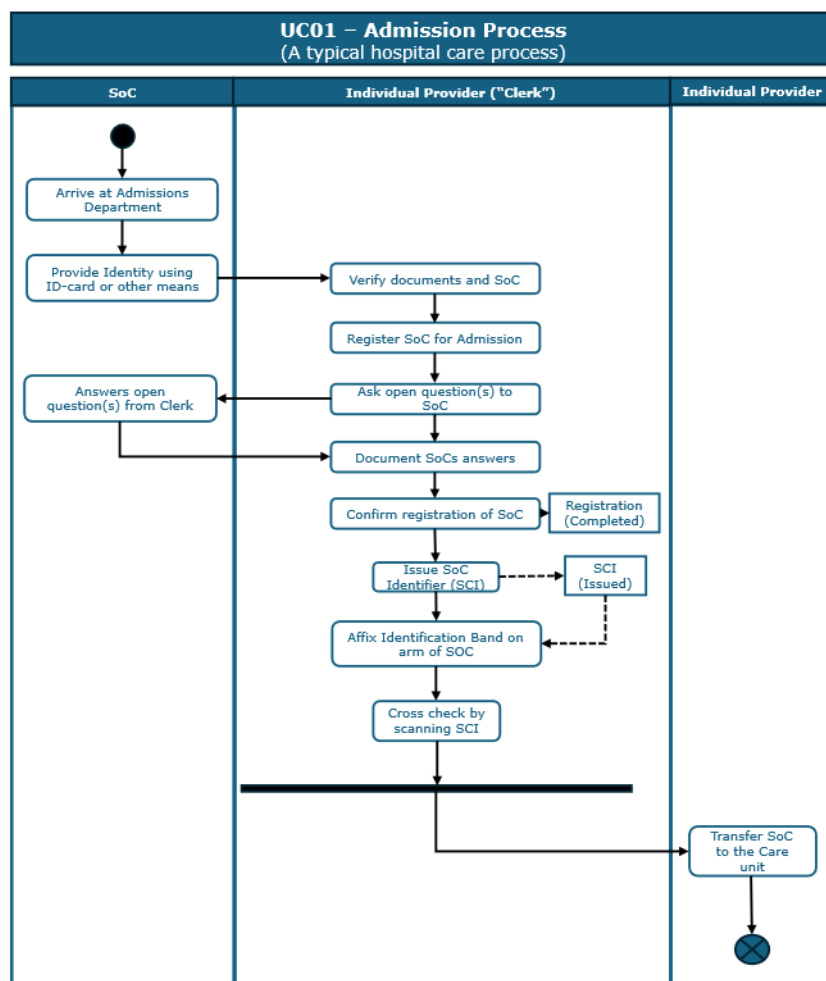
The following four “Use Cases” – UC01, UC02, UC03, and UC04 detail the typical movement of a Subject of Care (SoC) from admission to eventual discharge whilst being treated by a healthcare provider.

5.1 Admission Process – UC01

The Subject of Care (SoC) arrives at the admissions department and provides a means of proving their identity using a patient identification card or by other means, typical examples may include a National ID card, a doctor's referral letter, medical insurance information etc. The Admissions Clerk checks the SoC's identity, the reason for admission as detailed in the referral letter and, registers the SoC for admission. The SoC is issued a patient identification band detailing their family name, given name, biological sex, and other appropriate patient demographic data elements as required, as well as the SoC Identifier (GSRN) and any other associated data elements encoded in a GS1 DataMatrix barcode.

The GS1 DataMatrix barcode should be printed at least twice on either end of the patient identification band, so that one of these barcodes can be scanned, this minimises the movement of the patient by the Care Unit Staff should one of the barcodes be hidden by the patient's body position, it also acts a secondary backup should the other GS1 DataMatrix barcode be damaged or is not able to be scanned.

The patient identification band is attached to the patient usually around the wrist (or in some cases around the ankle) If any additional patient identification stickers are required for medical records / case notes etc. then these should be printed “on demand” at the point of care.



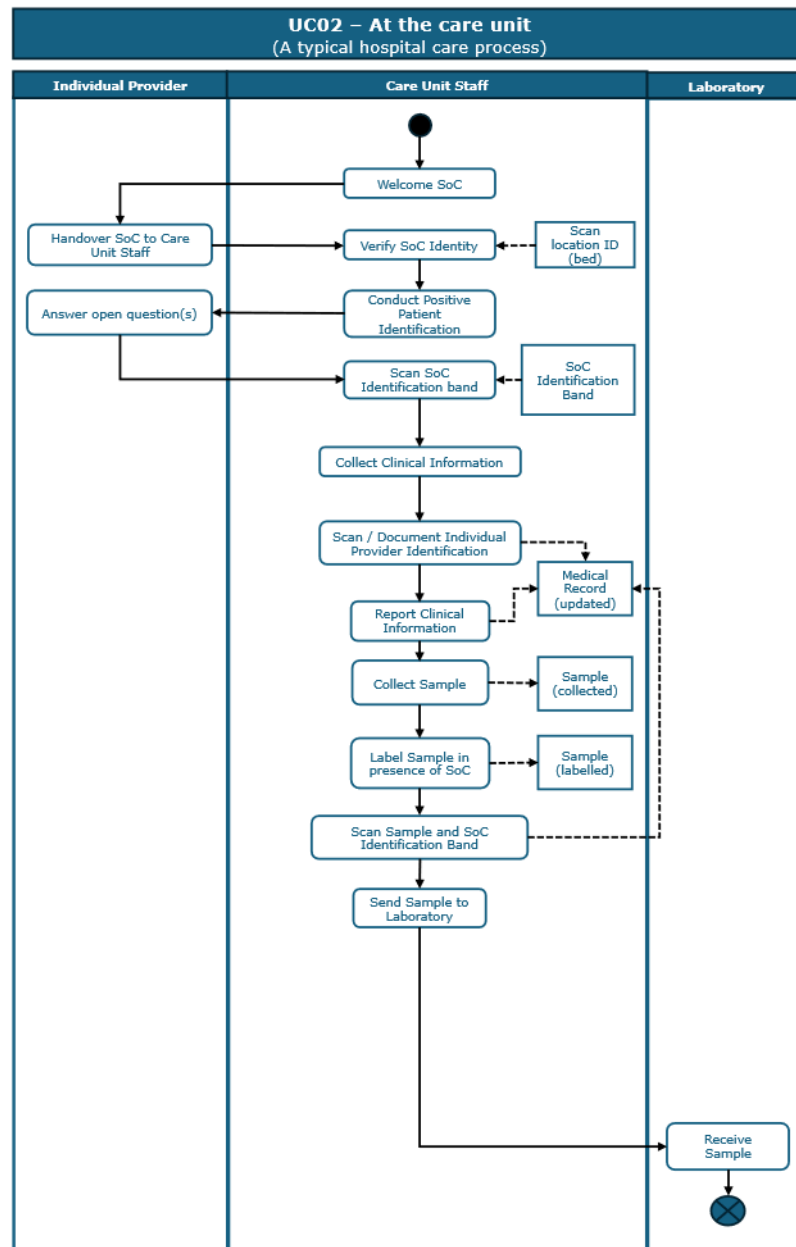
5.2 At the care unit – UC02

Upon arriving at the appropriate care unit for treatment, the care responsibility for the SoC is transferred to the care unit staff member who scans the SoC identification bands GS1 DataMatrix barcode (using the encoded data described in "Section 5.1 Admissions Process") to register the SoC in the ward, access their individual health records and if required prepare them for treatment. Based on orders / prescriptions, samples are taken, and each sample tube should be labelled with an appropriate barcoded label issued and printed on demand at the point of care.

When taking the patient samples and before shipment of the samples to the laboratory, the GSRN from the identification band should be linked to the label sample tube(s) barcode identifier. Results of the sample analysis are then used to update the SoC's individual health record. Patient samples are collected in a sample tube and sent to the hospital laboratory for the appropriate analysis as requested by the Care Unit Staff.

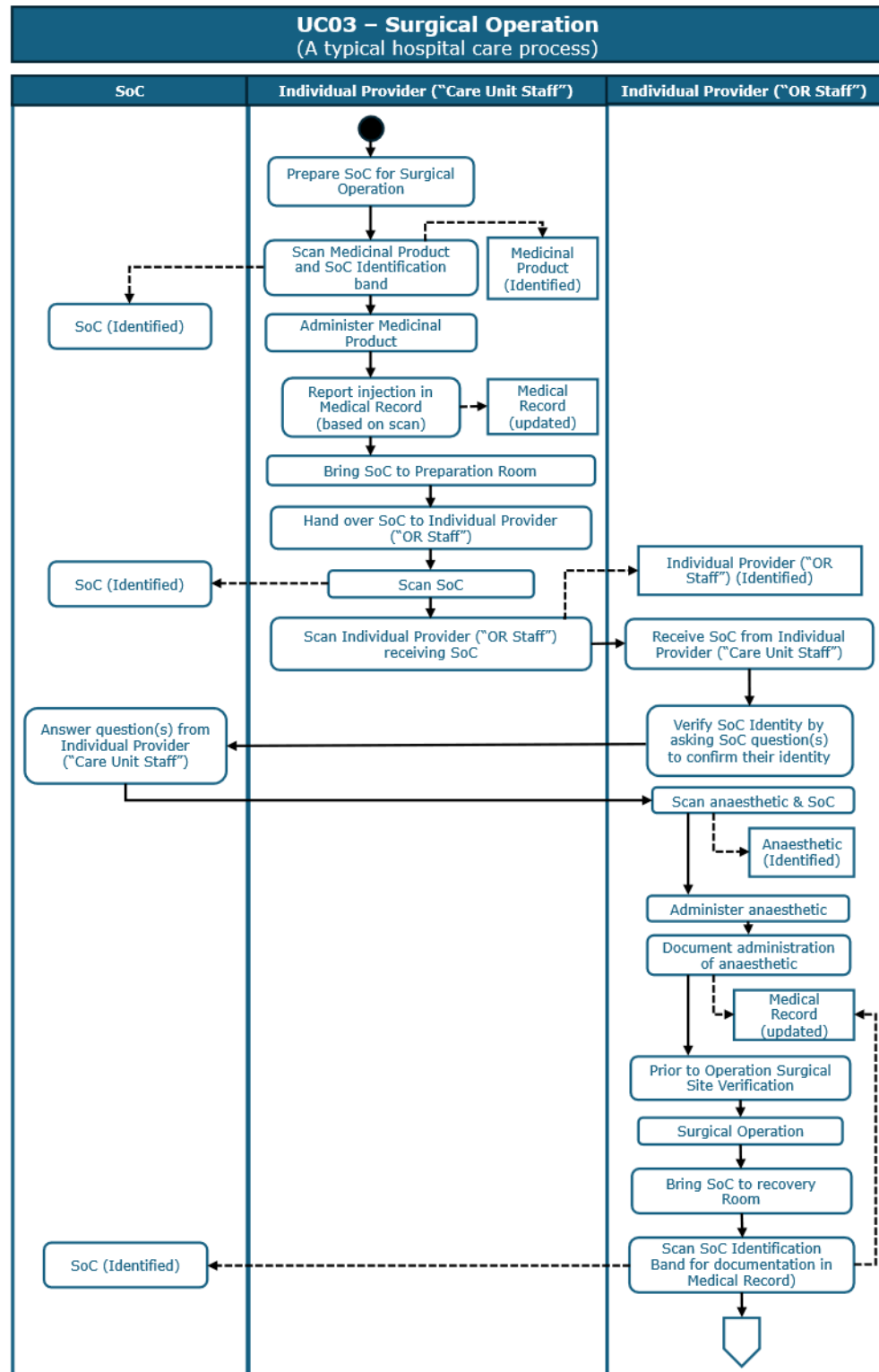
Identification of the bed as a location is addressed by assigning and recording a Global Location Number (GLN) and any other associated location identification information. Clinical information, i.e. temperature, blood pressure etc., is also captured and recorded.

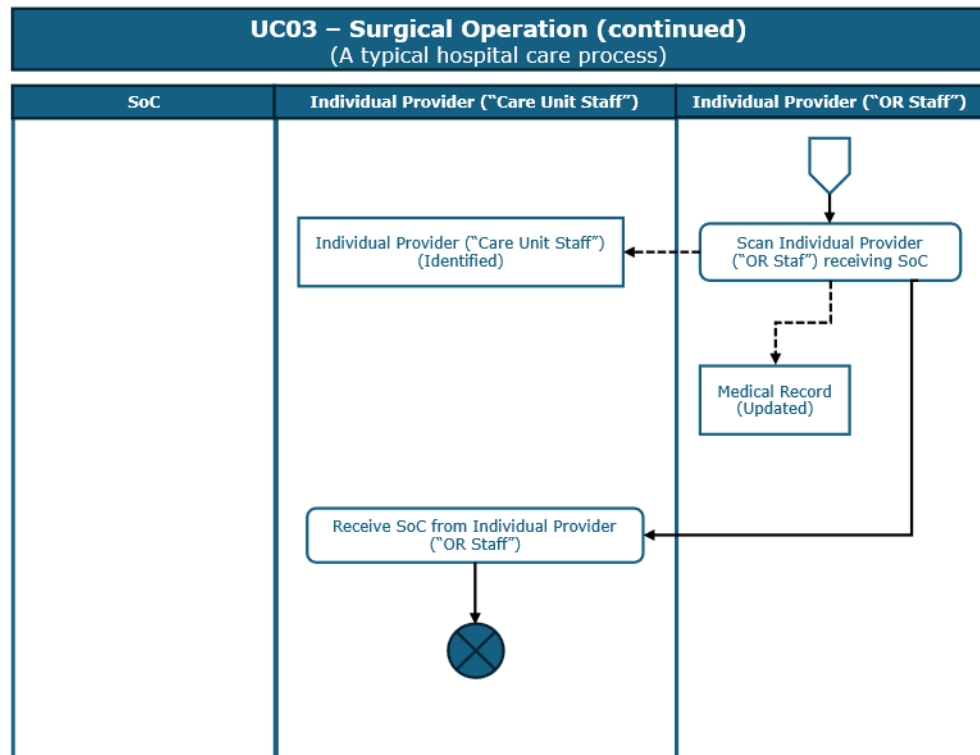
NOTE: A Global Location Number (GLN) can be used to identify a physical location which is a tangible place that may be represented by an address, coordinates, or other means - <https://www.gs1.org/standards/id-keys/gln>



5.3 Surgical Operation – UC03

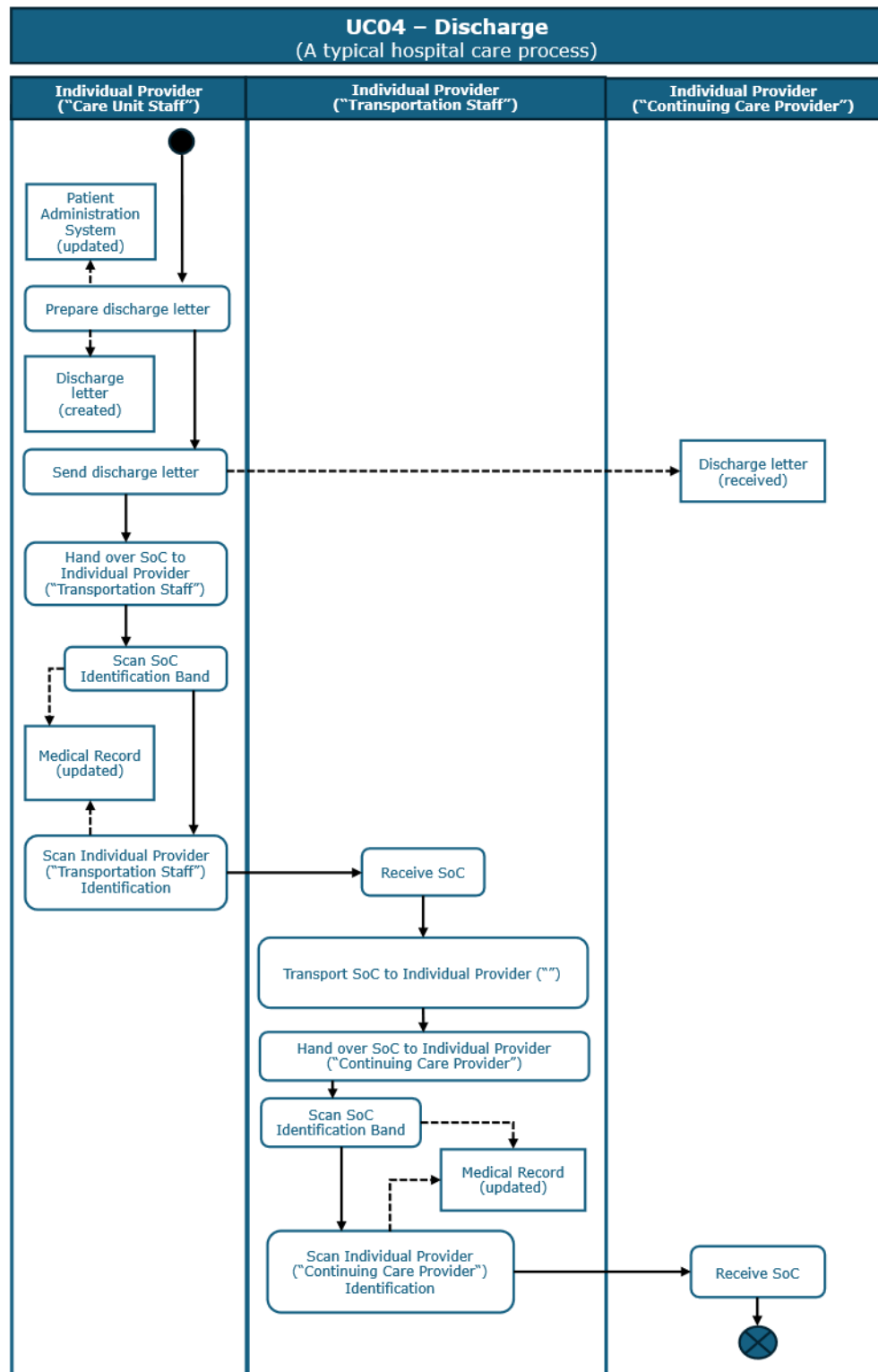
The SoC is prepared for their surgical procedure. For example a medicinal product is administered to the SoC, its identification barcode is scanned and this information is used to update the SoC's individual health record, the SoC is then brought to the preparation room where anaesthetics are administered. The SoC is transported into the operating theatre and after completion of the operation, the SoC is transferred to a recovery room. When the SoC is ready, the SoC is returned to the ward.





5.4 Discharge – UC04

Once the SoC has recovered and their care pathway is complete. The SoC is transferred to a rehabilitation clinic. A hospital discharge letter is prepared and this information is updated in the SoC's individual health record and sent ahead of the arrival of the SoC at the rehabilitation clinic.



6 Global Service Relation Number (GSRN) – Overview

The Global Service Relation Number (GSRN) is the GS1 identification key used to identify the relationship between an organisation offering services (in this case, any healthcare provider) and the recipient of services (in this case, the patient). The same GS1 identification key can be used to identify the relationship between the organisation offering the service and the provider of the service (in this case, the caregiver), but requires a different GS1 Application Identifier (8017), to clearly distinguish the role.

If there is a need to further identify service encounters of a particular service recipient or provider, the Service Relation Instance Number (SRIN) may be used in addition to the GSRN; for example, to identify the phase of a medical treatment for a patient.

For further information on the GSRN and SRIN please refer to the GS1 General Specifications - <https://ref.gs1.org/standards/genspecs/>

6.1 Why the GSRN is essential for the validation and verification of the “subject of care”

The ultimate goal of healthcare providers is the provision of quality healthcare. In other words, all healthcare providers aim to provide high-quality health services while minimizing risk. Using the Global Service Relation Number (GSRN) provides unique identification representing both caregivers and subjects of care (patients) in the service relationship. It enhances healthcare providers systems’ visibility of the patient pathway or patient journey, increasing patient safety and supporting patients’ rights. Scanning the barcoded GSRN at the point of care for the Subject of Care (SoC) identification minimizes medical errors (medication administration – surgery – wrong/redundant laboratory test, etc.), consequently improving patient safety and the performance of healthcare providers through accurate data storage.

The GSRN also allows timely access to patient information and medical records, it provides a reliable access to accurate, standardised, unified, and synchronized data sources. The GSRN can also be scanned by a patient or caregiver using mobile or other applications, to access their medical records.

In conclusion, the GSRN being a unique identifier provides a mechanism to ensure that “*patient rights*” are adhered to, these being the right patient, receiving the right procedure, by the right medical staff, at the right time, while maintaining accurate patient records.

Note: The term “*patient rights*” is a commonly used term detailing what a patient is entitled to whilst receiving care within a care environment. Some examples are detailed below:

1. World Health Organization (WHO) - Patient safety rights charter
<https://iris.who.int/bitstream/handle/10665/376539/9789240093249-eng.pdf?sequence=1>
2. The NHS in England patient safety strategy
<https://www.england.nhs.uk/patient-safety/>
3. Switzerland – Your rights and participation as a patient:
<https://www.bag.admin.ch/bag/en/home/medizin-und-forschung/patientenrechte.html>
4. South Africa – Patient charter:
<https://knowledgehub.health.gov.za/system/files/elibdownloads/2019-07/PATIENTS%2520RIGHTS%2520CHARTER%2520-%2520Eng.pdf>

6.2 GSRN and associated data elements

GS1 has defined several data elements that can be associated with a GSRN and encoded in a data carrier together with the GSRN.

- A number specifying the instance of an encounter between the SoC and the provider organisation (SRIN, a GS1 identifier extension to GSRN).

- Information about the object (media) presenting the data carrier; these media could be affixed to the SoC, like e.g. a wristband, or might contain material stemming from the SoC, like a test tube, (AIDC Media Type and VCN, GS1 informative data elements).
- Demographic information like the SoC's name or date of birth (GS1 informative data elements). Such information is crucial to validate the identity of the SoC. The GSRN is the key to retrieve this information from the master database of the provider organisation. However, in situations when such lookup is not feasible it is helpful to have this data communicated via the data carrier alongside the GSRN.

Informative data elements are meant to communicate supplementary information about the SoC, or the SoC and a specific service encounter, within the context of the relationship with the provider organisations.

Section 6.3 provides a more detailed explanation of GSRN associated data elements and GS1 Application Identifiers.

6.3 GS1 Application Identifiers definitions

6.3.1 Introduction

This section describes the meaning, structure and function of the GS1 system element strings so they can be correctly processed in users' application programmes. An element string is the combination of a GS1 Application Identifier (AI) and a GS1 Application Identifier (AI) data field. The GS1 Application Identifier (AI) is two or more digits; it qualifies the format and the meaning of the subsequent data field. The allowable character set to be used for GS1 Application Identifier (AI) data fields is defined in section 6.3.2 There are AIs that have additional syntax restrictions, e.g., numerical only; see below definition for each AI.

6.3.2 GS1 Application Identifiers in numerical order

Figure 6.3.2-1 GS1 Application Identifiers GS1 Application Identifiers relevant to Supporting Verification of Patient Identification

AI	Data Content	Format*	FNC1 Required*	Data Title
7241	AIDC media type: AI (7241)	N4+N2	(FNC1)	AIDC MEDIA TYPE
7242	Version Control Number (VCN): AI (7242)	N4+X...25	(FNC1)	VCN
7250	Date of birth: AI (7250)	N4+N8	(FNC1)	DOB
7251	Date and time of birth: AI (7251)	N4+N12	(FNC1)	DOB TIME
7252	Biological sex: AI (7252)	N4+N1	(FNC1)	BIO SEX
7253	Family name of person: AI (7253)	N4+X..40	(FNC1)	FAMILY NAME
7254	Given name of person: AI (7254)	N4+X..40	(FNC1)	GIVEN NAME
7255	Name suffix of person: AI (7255)	N4+X..10	(FNC1)	SUFFIX
7256	Full name of person: AI (7256)	N4+X..90	(FNC1)	FULL NAME
7257	Address of person: AI (7257)	N4+X..70	(FNC1)	PERSON ADDR
7258	Baby birth sequence indicator: AI (7258)	N4+N1+X1+N1	(FNC1)	BIRTH SEQUENCE
7259	Baby of family name: AI (7259)	N4+X..40	(FNC1)	BABY
8018	Global Service Relation Number (GSRN) to identify the relationship between an organisation offering services and the recipient of services: AI (8018)	N4+N18	(FNC1)	GSRN - RECIPIENT
8019	Service Relation Instance Number (SRIN): AI (8019)	N4+N..10	(FNC1)	SRIN

*Technical details about data format and the Function 1 Symbol Character (FNC1) are defined in the GS1 General Specifications - <https://ref.gs1.org/standards/genspecs/> and may also be viewed through the GS1 Application Identifier browser - <https://ref.gs1.org/ai/>



Note: The mandatory identifier used for “Supporting the Verification of Patient Identification” is the GSRN, it is up to the implementor to decide which other identifiers are used to meet the implementors requirements for adoption / implementation.

6.3.3 AIDC media type: AI (7241)

The GS1 Application Identifier (7241) indicates that the GS1 Application Identifier data field contains an AIDC media type. The AIDC media type allows the differentiation of what type of object or entity the GS1 AIDC data carrier is displayed or carried on. For example, a GS1 AIDC data carrier encoded with a Global Service Relation Number (GSRN) may be displayed on an identity card or an order form.

For further information on this GS1 Application Identifier please refer to the GS1 General Specifications - <https://ref.gs1.org/ai/7241>

Detailed below is the current AIDC Media Type table values, these may change based on future requirements, please refer to the GS1 General Specifications for the most up to date table values.

Figure 6.3.3-1 Overview of the AIDC media type table values

AIDC media type - value	AIDC media type – value range assignments
00	Not used
01 to 10	Current ICCBBA assignment
11 to 29	Reserved for ICCBBA future assignment
30 to 59	Reserved for GS1 assignment
60 to 79	Reserved for future capacity needs of ICCBBA or GS1 if the initial capacity of values for either organisation is exhausted
80 to 99	Reserved for local or national use

Figure 6.3.3-2 AIDC media type table values

AIDC media type value	AIDC media type	Defined by
00	Not used	ICCBBA
01	Wristband	ICCBBA
02	Order form	ICCBBA
03	Sample Tube	ICCBBA
04	Working list / Lab list / form	ICCBBA
05	Test report	ICCBBA
06	Delivery note / issue documentation	ICCBBA
07	Intended recipient label (attached to container)	ICCBBA
08	Label affixed to product	ICCBBA
09	Identity card	ICCBBA
10	Clinical or progress notes	ICCBBA

11-29	Reserved for ICCBBA future assignment	ICCBBA
30-59	Reserved for GS1 future assignment	GS1
60-79	Reserved for future capacity needs of ICCBBA or GS1 if the initial capacity of values for either organisation is exhausted	ICCBBA or GS1
80-99	Reserved for local or national use	ICCBBA

- ✓ **Note:** The values above are technical standards. Normative GS1 use of these values is established within application standards (e.g., management of biological samples could potentially use this AI on several AIDC media types, for example, a patient wristband, the sample tube itself, or a staff ID card).
- ✓ **Note:** GS1 and ICCBBA independently, but collaboratively, administer AIDC media type value definitions and their normative use. For example, GS1 may or may not normatively use a media type defined by ICCBBA and vice versa. This independence could result in a duplicate value if both organisations were considering it at the same time. To avoid this, both organisations have agreed to notify the other when new values are being considered.

ICCBBA - www.isbt128.org - is an international non-profit organisation, based in the US, that manages, develops, and licenses ISBT 128, the international information standard for the terminology, coding and labelling of medical products of human origin. The acronym ICCBBA is derived from the International Council for Commonality in Blood Banking Automation.

6.3.4 Version Control Number (VCN): AI (7242)

The GS1 Application Identifier (7242) indicates that the GS1 Application Identifier data field contains a Version Control Number (VCN)

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7242>

6.3.5 Date of birth: AI (7250)

The GS1 Application Identifier (7250) indicates that the GS1 Application Identifier data field contains the date of birth.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7250>

6.3.6 Date and time of birth: AI (7251)

The GS1 Application Identifier (7251) indicates that the GS1 Application Identifier data field contains a date and time of birth. When there is no business requirement to express the time of birth then the use of GS1 Application Identifier (7250) should be used.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7251>

6.3.7 Biological sex: AI (7252)

The GS1 Application Identifier (7252) indicates that the GS1 Application Identifier data field indicates the biological sex of the subject of care as defined and detailed in "ISO/IEC 5218:2022 Information technology — Codes for the representation of human sexes".

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7252>

6.3.8 Family name of person: AI (7253)

The GS1 Application Identifier (7253) indicates that the GS1 Application Identifier data field contains family name of person information for the purpose of aiding positive patient identification, which may contain non-Latin characters.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7253>

✔ **Note:** To encode non-Latin characters within the alphanumeric value, use percent-encoding as defined within RFC 3986. A space character should be encoded as a single plus symbol, +.

6.3.9 Given name of person: AI (7254)

The GS1 Application Identifier (7254) indicates that the GS1 Application Identifier data field contains given name information for the purpose of aiding positive patient identification, which may contain non-Latin characters.

✔ **Note:** To encode non-Latin characters within the alphanumeric value, use percent-encoding as defined within RFC 3986. A space character should be encoded as a single plus symbol, +.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7254>

6.3.10 Name suffix of person: AI (7255)

The GS1 Application Identifier (7255) indicates that the GS1 Application Identifier data field contains name suffix of person information for the purpose of aiding identification, which may contain non-Latin characters.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7255>

6.3.11 Full name of person: AI (7256)

The GS1 Application Identifier (7256) indicates that the GS1 Application Identifier data field contains full name of person information for the purpose of aiding positive patient identification. This field is a composite data element that is captured through the combination of Application Identifiers (7253) Family name of person, (7254) Given name of person and (7255) Name suffix of person, which may contain non-Latin characters.

✔ **Note:** To encode non-Latin characters within the alphanumeric value, use percent-encoding as defined within RFC 3986. A space character should be encoded as a single plus symbol, +.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7256>

6.3.12 Address of person: AI (7257)

The GS1 Application Identifier (7257) indicates that the GS1 Application Identifier data field contains an Address of a person, which may contain non-Latin characters.

- ✓ **Note:** To encode non-Latin characters within the alphanumeric value, use percent-encoding as defined within RFC 3986. A space character should be encoded as a single plus symbol, +. For more information, see Section 7.1.7 Addressing the support for special characters.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7257>

6.3.13 Baby birth sequence indicator: AI (7258)

The GS1 Application Identifier (7258) indicates that the GS1 Application Identifier data field indicates the baby birth sequence indicator and is used to identify the sequence in which a baby was born and the total number of babies in the series.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7258>

6.3.14 Baby of family name: AI (7259)

The GS1 Application Identifier (7259) indicates that the GS1 Application Identifier data field contains Baby of family name information for the purpose of aiding positive patient identification. This field is a composite data element that is captured through the combination of the Application Identifier (7253) Family Name and free text indicating the identification of the specific "baby" being identified. As a free text field for name identification information, non-Latin characters and a space character may be encoded.

- ✓ **Note:** To encode non-Latin characters within the alphanumeric value, use percent-encoding as defined within RFC 3986. A space character should be encoded as a single plus symbol, +.
- ✓ **Note:** Baby of family name – In many countries it is common for a child to be born and initially not provided a "given name" by the mother, parents etc. Depending on the jurisdiction it then becomes a legal requirement to decide the "given name" within a defined period of time, for example in the UK it is 42 days and Norway it is 90 days.
- ✓ **Note:** A family name may also be known as a "*surname*" or "*last name*".

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/7259>

6.3.15 Global Service Relation Number (GSRN) to identify the relationship between an organisation offering services and the recipient of services: AI (8018)

The GS1 Application Identifier (8018) indicates that the GS1 Application Identifier data field contains a GSRN (Global Service Relation Number) for a recipient of services. The GSRN is used to identify either the recipient or individual provider of services in the context of a service relationship. In order to provide identification for both roles in a service relationship, recipient and provider, two GSRN AIs are available, these being AI (8018) for the recipient of services and AI (8017) individual provider of services. The resultant element string provides a means for the service provider to store data relevant to services provided to the recipient and by the individual provider.

The GS1 Company Prefix is allocated by GS1 Member Organisations to the company that allocates the GSRN – here the organisation offering the service. It makes the number unique worldwide.

The structure and content of the service reference is at the discretion of the organisation offering the service in order to uniquely identify each service relation.

The check digit is explained in section 6.4, its verification, which must be carried out in the application software, ensures that the number is correctly composed.

The Global Service Relation Number (GSRN) – Provider identifies the relationship between an organisation offering services and the provider of services.

For further information on this GS1 Application Identifier (AI) please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/8018>

6.3.16 Service Relation Instance Number (SRIN): AI (8019)

The GS1 Application Identifier (8019) indicates that the GS1 Application Identifier data field contains a Service Relation Instance Number (SRIN). The SRIN is used when the Global Service Relation Number (GSRN) of a service provider (8017) or service recipient (8018) needs to be further qualified with a sequence indicator corresponding to an encounter or an instance of a service.

For further information on this GS1 Application Identifier please refer to the GS1 Application Identifier browser - <https://ref.gs1.org/ai/8019>

6.3.17 Company and internal information: AIs (91 – 99)

GS1 Application Identifiers (91) to (99) refer to internal company information and are not intended for use in an open value chain network. However, these are used in some regions because specific GS1 Application Identifiers for patient demographic use were not previously available.

Each Internal Application Identifier (AI) supports up to 90 alphanumeric characters and can be used for any application needed within each specific healthcare organisation. These AIs are not intended for use in an environment where different service providers in different countries operate and are viewed as options to support transitioning to standardised GS1 Application Identifiers (AIs) when no other option exists. As these AIs are defined for use by individual healthcare organisations for their own operations, how systems interact with them will greatly vary. These AIs SHOULD be removed from any item or Subject of Care (SoC) that leaves the jurisdiction of the healthcare organisation.

6.4 Standard check digit calculations for GS1 data structures

What is a check digit? The last digit of all fixed-length, numeric GS1 Identification Keys is a check digit that ensures the integrity of the key. This algorithm is identical for all fixed length numeric GS1 data structures including the Global Service Relation Number (GSRN)

Please use the following tools to calculate and check that the check digit is correctly structured:

<https://www.gs1.org/services/check-digit-calculator>

<https://www.gs1.org/services/how-calculate-check-digit-manually>

6.5 Company Internal Information: AIs (91 to 99) – Existing Use and migrating to GS1 Application Identifiers

It is recommended to transition to the new patient demographic GS1 Application Identifiers (AIs) after their publication in the GS1 General Specifications. However, where an implementation requires the use of AIs (91) to (99) due to local requirements (*All local legal and regulatory requirements supersede these guidelines.*) follow the guidelines for their use as covered in the appropriate section detailing “Company internal information”: AIs (91) to (99).

For further information on this GS1 Application Identifier please refer to the GS1 General Specifications - <https://ref.gs1.org/standards/#genspecs>

The use of GS1 barcoding and data standards provides fast and accurate data capture within the healthcare care chain, improved electronic data sharing between healthcare patient and clinical systems. GS1 Application Identifiers (AIs) are defined, detailed and structured for each “data element”, the use of Internal Application Identifiers commonly known as AIs (91) to (99) allow users to implement data structures that have no defined data structure and business application, but these data sets **cannot** be shared outside of their closed loop care environment.

To transition from GS1 Internal Application Identifiers to GS1 Application Identifiers requires several steps as follows:

1. Identify the data being currently used for each business requirement for example "Patient Name", "Given Name" or "Family Name" etc.
2. Ensure the semantics for the existing and future identifiers is understood and match the specific requirements.
3. Ascertain if there is a corresponding and existing GS1 Application Identifier for this particular data set requirement.
4. Ascertain what is the current character set being used and what is allowed within the corresponding GS1 Application Identifier data set.
5. Agree on an internal process for the management and use of all "Internal Application Identifiers"
6. Document the use of each "Internal Application Identifier" within the care environment and ensure that its use is unique and is not duplicated.
7. Share information with all stakeholders on the definition, details, data structure of each "Internal Application Identifier" being used and how they map to newly used "GS1 Application Identifier(s)"
8. Ensure that any GS1 Internal Application Identifier that ceases to be used due to a successful migration to a GS1 Application Identifier is never reallocated or reused for another business purpose.

Table 6.5-1 Examples of mapping Internal Application Identifiers to GS1 Application Identifiers

Internal Application Identifier	Definition and Use	GS1 Application Identifier	Definition and Use
AI (91)	Given Name and Family Name. Example: (91)James+Bond	AI (7254) and AI (7253) or AI (7256)	AI (7254) for Given name of person and AI (7253) for Family name of person or the use of AI (7256) for the Full name of person Example: (7254)James(7253)Bond or (7256)James+Bond
AI (92)	Biological Sex Example: (92)Male	AI (7252)	AI (7252) for Biological sex Example: (7252)1
AI (93)	Date of Birth Example: (93)1968-Jan-05	AI (7250)	AI (7250) for Date of birth Example: (7250)19680105

7 Barcoding the GSRN

The following section details information on how best to use the GS1 DataMatrix barcode and the data sets available to support the “verification of patient identification”, along with considerations for both physical and digital use, human readable text should the barcode be unable to scan and how to encode “special characters”,

7.1 GSRN barcode environment use

7.1.1 Digital

The digital form is becoming increasingly common for the use of displaying a barcode to allow a care provider the ability to scan the “digital” barcode for the purposes of patient identification, provision of treatment, or medication dispensing. The digital form is when a barcode is not printed but formed and displayed on a computer, phone, tablet, or other electronic display. The use of mobile / digital devices and associated “apps” for patient treatment are being increasingly used for a multitude of healthcare purposes including the following non-exhaustive list:

Providing proof of identity – “verification / validation of patient identification”

Digital prescriptions allowing patients the opportunity to order and collect repeat medication from a pharmacy without having to visit a doctor or healthcare provider. See the following for example information - <https://digital.nhs.uk/services/nhs-app/nhs-app-features/prescriptions-in-the-nhs-app>

7.1.2 Physical

The physical use is defined as the actual printed material that the barcode will be printed on, whether that is a wristband / identity band, a printed label that is then applied to other documentation used for patient treatment.

7.1.3 Choose the right barcode

■ GS1 DataMatrix:

- GS1 DataMatrix is a subset of Data Matrix that is specifically designed for encoding GS1 element string syntax
- Is the only 2D barcode used in healthcare for the “*Verification of Patient Identification*”.
- Small footprint (panel size) on patient wristbands, identity bands, regulated healthcare products and other healthcare applications
- Its ability to encode all information in one symbol and do so efficiently in terms of print speed and panel size
- Available option in imaging scanners

7.1.4 Compliant barcodes

Barcodes are symbols that can be scanned optically using electronic devices such as barcode scanners or mobile devices. The GS1 DataMatrix barcode is used to encode identification data such as the GSRN or the GSRN and SRIN, as well as informative data (e.g., VCN, AIDC Media Type, etc.) using the GS1 element string syntax. Compliance with GS1’s barcode quality standards and the GS1 syntax rules ensure that the GS1 DataMatrix barcode can be scanned by all healthcare stakeholders, including but not limited to healthcare service providers, care providers, ambulatory service providers and others.

7.1.5 Placement and duplicate barcodes

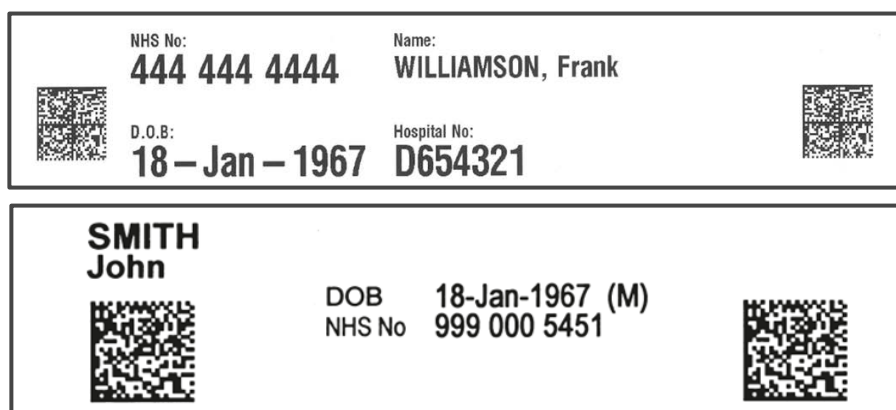
Patient identification barcodes can be used on various printed media, the most commonly used are on patient wristbands, patient identity bands and patient identification cards.

The patient “wristband” or “identity band” needs to remain on the patient whilst the patient continues to receive treatment, therefore the barcode used **MUST** also remain visible at all time. To facilitate this, it is common practice to print **two** barcodes on the printed “wristband” or “identity band”.

- This allows the patient barcode to be scanned without causing the patient any discomfort.
- Acts as a failsafe should one of the barcodes become damaged and not possible to scan.
- The barcodes are typically printed at opposite ends of the wristband” or “identity band”.

The barcodes are duplicated and contain exactly the same information.

Figure 7.1.5-1 Examples of the two GS1 DataMatrix barcodes used and their placement.



- ✓ **Note:** The images in Figure 7.1.5-1 are for illustrative purposes only
- ✓ **Note:** Occasionally a medical condition or procedure may prevent the wearing and application of a patient wristband / identification band allowing easy access to the barcode(s). In this instance it is the responsibility of the provider of care to determine where a patient wristband / identity band may be placed to ensure both patient safety and comfort are not compromised.

7.1.6 Human readable text

There are two types of text that appear on a “wristband” or “identity band” these are: human readable interpretation (HRI) and non-HRI text.

- Human readable interpretation (HRI) represents the same data encoded in the barcode and is displayed with parentheses around the AIs.
- Non-HRI text is all other text which may or may not be encoded in the barcode.

For example, all the text shown in the wristbands in Figure 7.1.5-1 is non-HRI text because it does not match exactly what is encoded in the barcodes.

7.1.7 Addressing the support for special characters

Many of the data elements that are used within the “patient demographics” approach will contain characters that are not supported by GS1 Application Identifiers and cannot be included in the GS1 DataMatrix barcode as-is for use when “*Supporting Verification of Patient Identification*”.

Common examples of such characters are “space” and so-called non-Latin characters such as ä, Ü, ñ, Ô, ç and entire languages (e.g., Korean, Thai, Chinese).

The characters that can normally be encoded within a barcode are those appearing in the GS1 AI encodable character set 82, which is an invariant subset of ISO/IEC 646, as shown in Figure 7.11-1 of the GS1 General Specifications. This does not include any non-Latin characters.

Fortunately, the global Unicode standard UTF-8 is widely used in the World Wide Web to define how these so-called "special characters" may be expressed using hexadecimal characters (0-9 and A-F) to identify such characters within the Unicode character code tables. By using UTF-8 in combination with Percent-encoding defined within RFC 3986, it is possible to express any "special" character within a Web URI or within in the string of "allowed" characters that may be encoded in the barcode. This approach ensures that anybody who reads the barcode and decodes it will be able to recreate the correct content for each data element in the barcode even if those data elements contained "special characters". For this reason, the GS1 General Specifications will note that percent-encoded values may appear within the encoding of GS1 Application Identifiers 7253, 7254, 7255, 7256, 7257 and 7259 and that if such percent-encoded sequences appear, they should be decoded to the corresponding special characters.

7.1.7.1 Percent encoding of symbol characters and space

Although space characters frequently appear within address information, the 82-character invariant subset of ISO/IEC 646 does not include the space character.

A space character can be percent-encoded as %20, although URL encoding often makes use of + as an alias alternative for %20. The use of + instead of %20 will reduce the number of symbol characters, potentially resulting in a smaller barcode. Because of the special use of + and % in percent-encoding, additional care needs to be taken if a literal plus or percent symbol need to appear as data in elements such as a company name or address.

As explained in figure 10-1, a literal plus symbol and percent symbol needs to be percent-encoded as %2B and %25 respectively, while a space character needs to be expressed as + or %20

Table 7.1.7.1-1 Encoding graphic symbols within transport process element strings.

Graphic Symbol	Symbol name	When used within element string for GS1 AIs XXXXXXXX encode as follows
!	Exclamation mark	!
"	Quotation mark	"
%	Percent sign	%
&	Ampersand	&
'	Apostrophe	'
(	Left parenthesis	(
)	Right parenthesis	)
*	Asterisk	*
+	Plus sign	%2B
,	Comma	,
-	Hyphen/Minus	-
.	Full stop	.
/	Solidus	/
:	Colon	:
;	Semicolon	;
<	Less-than sign	<
=	Equals sign	=
>	Greater-than sign	>
?	Question mark	?
_	Low line	_

Graphic Symbol	Symbol name	When used within element string for GS1 AIs XXXXXXXX encode as follows
	Space	+ or %20

The correct sequence for making these substitutions is critical, to avoid encoding twice. For encoding in GS1 element strings the following steps should be followed:

- Every literal % SHALL be replaced with %25
- Every literal + SHALL be replaced with %2B
- Space characters SHALL be replaced with + or %20

For example, if GS1 AI (7257) is meant to express:

“164 North Dutton Street, Santa Monica, California”

This must be written within an element string for encoding as:

7257164+North+Dutton+Street,+Santa+Monica,+California

When decoding, every + must be replaced with %20 before using an appropriate URL decode function.

7.2 Printing, reading and processing the GS1 DataMatrix barcode

7.2.1 GS1 Barcode Syntax Resource

The GS1 Barcode Syntax Resource (BSR) is a collection of three assets that provides the tools required by solution providers and users to correctly implement, apply, and stay aligned to GS1 standards in a simple and consistent manner. The GS1 Barcode Syntax Resource can be integrated directly into an application’s code base or simply used as a reference for transliteration into third-party code as required by the solution build system. The assets can be fully or partially implemented based on the user’s requirements and serves as a foundation for building application or user-specific requirements. The assets are as follows:

GS1 Barcode Syntax Dictionary is a simple, open-source text file that contains a list of all currently assigned GS1 Application Identifiers (AIs) and the necessary components for creating a compliant GS1 barcode syntax

GS1 Barcode Syntax Tests is a set of 'C' language-based source code files that provides instructions to perform a series of analytical actions to check if the data, whether input by keyboard or scanner, is valid against GS1 conformance specifications and rules for the GS1 barcode syntaxes.

GS1 Barcode Syntax Engine is an example of the harmonised framework required to implement the GS1 Barcode Syntax Dictionary and Syntax Tests, to facilitate the detection and conversion of GS1 barcode syntaxes.

The resource offers a baseline for the adoption of the most important, fundamental, GS1 conformance specifications and rules, so that solutions can adopt GS1 standards easily and consistently. Allowing any application or user specific needs to be built on top of this solid foundation. Figure 7.1.5-1 is an example of how that may work in the real world, with the resource being utilised at the point of barcode creation, and again when the barcode is scanned and data is transmitted for use within various applications, such as for *“Supporting the Verification of Patient Identification”*, for a mobile app.

The Barcode syntax resources can be found here:

<https://www.gs1.org/standards/gs1-barcodes/gs1-barcode-syntax-resource>

By adopting the GS1 Barcode Syntax Resource, barcode solutions can easily create and process conformant GS1 barcode syntaxes encoded to linear or 2D barcodes used within the GS1 system.

This enables industry and the broader GS1 user community to use the full benefits of using any barcode or syntax from the GS1 system and to experience a truly interoperable and standardised implementation of GS1 standards for all their operational data needs, while facilitating the use of a GS1 DataMatrix barcode.

The Barcode Syntax Resource User Guide can be found here: <https://ref.gs1.org/tools/gs1-barcode-syntax-resource/user-guide/>

7.2.2 Reading (scanning)

GS1 compliant barcodes are structured in a way to allow systems to read as much, or as little data as is required. It is essential that systems are future proofed, scalable, and robust when presented with any of the wide array of standard barcodes (EAN-13, GS1-128, GS1 DataMatrix etc.)

Many GS1 barcodes (GS1-128, GS1 DataMatrix, etc.) contain a number of data elements. These data elements are encoded in the barcode and prefixed with GS1 Application Identifiers (AIs), which identify the various data elements and determine the format and meaning of each data element contained in the barcode.

When implementing scanning in your processes it is essential that your systems can receive, understand, store, and send GS1 Identifiers, and be able to “parse” a barcode correctly, in other words consistently recognise and understand the GS1 Application Identifiers (AIs) in the barcode, store what is needed and simply ignore the rest regardless of the order in which the data is presented.

One of the most common mistakes made by software developers when trying to extract data from GS1 barcodes is to assume that the data is always in the same place within the barcode. There is a recommended order, but it cannot be assumed that this will be followed.

In order to correctly parse or “extract” that data, every developer needs to know a number of things when developing their own systems.

- Do not assume that the data is always in the same place within the barcode.
- Allow for the fact that most AIs will come in variable lengths, and you must trap the <FNC1> character to determine the length of each AI
- It is essential to allow for all GS1 Application Identifiers (AIs) even those that will not be processed
- Allow for undefined or unknown GS1 Application Identifiers (AIs)

As the BSR can be adopted by systems that need to read GS1 barcodes as well as store and use GS1 AI data, please refer to Section 7.2.1 for more information.

7.2.3 Receiving systems

All systems should be capable of handling the GS1 standards for the “Verification of patient identification”. Compliance means that healthcare IT / clinical systems can cater for the GS1 Identifiers required such as the GSRN (patients and/or staff) and the Service Relation Instance Number (SRIN),, as well as associated GS1 informative data such as Version Control Number (VCN), AIDC Media Type and the suite of patient demographic data elements.

The scope of this process is for all systems to be capable of the following:

- Process, store and report the GSRN and all associated attributes
- Capture the GSRN when scanned by a barcode reader.
- The fields that hold the GSRN should be compliant with GS1 Application Identifier (8018) field length 18 digits; numeric, last digit is a GS1 check digit.

The system must be capable of scanning the GS1 DataMatrix barcode and appropriately storing all patient identification data and information in the barcode:

- GSRN, SRIN, VCN, AIDC Media Type and patient demographic data elements.

7.2.4 Stakeholders' roles and responsibilities

Below are some healthcare stakeholders the Solution Provider should consider when collaborating on the use case for GS1 DataMatrix implementation.

 **Note:** Table 7.2.5-1 is not in any particular order.

Table 7.2.5-1 Stakeholders' roles and responsibilities

Role type	Role description / responsibilities	Implementation responsibility (i.e., change/action required, specific to 2D)	Implementation phasing (i.e., who does what first; who's actions are dependent/conditional on another)
Ambulance services	Identify patients (accidents- live saving/ first action reporting/ initial case description)	IT Departments and Clinical Educators will need to work on processes that allow for data capture and interoperability with receiving institutions.	Once systems are available data captured should lead to interoperable information transfer.
Insurance companies/ payers	Receive/approve requests for data sharing (facility to facility)	Identify authorization and data accessibility	Use interoperable systems and use the standards for confirmation of patient attendance or issuing equipment or work to a patient
Healthcare providers (not exhaustive), hospitals, clinics, care homes etc.)	Clinical staff stakeholder e.g. nurse, doctor, consultant etc. Patient Safety and Quality Lead(s) IT Staff EHR Staff Patient Admission Staff Business Continuity Staff (responsible for business change) Laboratory Staff – checking patient biological samples etc.	Identify authorization and data accessibility. Identify the type of data shared with patients/other stakeholders. Ensure patient records are updated, accurate, and complete.	Ensure sufficient training is in place to recognise the new standards and to capture data at the correct point. Be prepared to educate users on the ability to capture or verify demographic using the standard Be prepared to educate users on the ability to capture or verify demographic using the standard. Ensuring that verbal confirmation is taken first and then data is transferred using AIDC. Identify opportunity for data capture when systems are not linked to the network.
Hardware/ equipment providers	Providing technical solutions to healthcare care providers.	N/A	N/A
Hospital IT systems	N/A	N/A	N/A
Remote medical consultation	Review patient info embedded in GSRN. Medical review	N/A	N/A
Accrediting Agencies	Ensuring any standard / guidelines are approved and implemented	N/A	N/A

Role type	Role description / responsibilities	Implementation responsibility (i.e., change/action required, specific to 2D)	Implementation phasing (i.e., who does what first; who's actions are dependent/conditional on another)
Healthcare Provider – IT Departments	Ensure that existing software companies are aware of the change in standards and include the new standard in software contract / tender specifications	Ensure that once the systems are available that sufficient hardware is available to read the standard Identify the type of data shared with patients/other stakeholders.	Once systems are available the implementation availability in a healthcare setting needs to be assessed for how the standard will be accessed and used. Consider the ability to use interoperable data
Patient Safety Regulators	Clinical Excellence Oversight Healthcare Policy	N/A	N/A
Patient Advocacy Groups	N/A	N/A	IAPO – International Alliance of Patient Organisations FDA - Advisory Group
Public authorities (if needed)	N/A	N/A	
Hospital Associations	N/A	N/A	Brazilian Hospital Federation American Hospital Association

7.3 GS1 Compliant GS1 DataMatrix barcodes

Users may need to determine whether the GS1 DataMatrix barcode that is being scanned and used has been implemented according to GS1 standards, using the correct barcode and that the data has been encoded correctly. The use of a mobile phone app can be helpful for users to check whether the barcode implemented is a GS1 DataMatrix, in accordance with GS1 standards. Some apps can also show what data has been "parsed" or "decoded", rather than simply displaying the full data string, which is helpful for users to check if the encoded data is valid and in accordance with GS1 standards.



Note: These mobile device apps will not provide quality grading information as to the printing grade on the printed output, for information on this please see Section 7.3.1 on "Barcode Quality" and Section 7.6 on "Verification".



Important Subject of Care Privacy Note: Use of mobile barcode scanning apps will allow users to read the data contained in the barcode. GS1 is not responsible for the content of the data displayed by a mobile barcode scanning app. Local consideration should be given to the accessibility of data contained in a barcode only the format of the data. A mixture of physical and cyber security measures should be considered to ensure that reading of barcodes is limited to legitimate use. This should also include consideration of the ability to use verifier apps on published media images.

7.3.1 Barcode Quality

The GS1 General Specifications defines GS1 Application Standards which provide specifications for barcode production, such as the barcode's X-dimensions (bar width or module size), minimum height (linear barcode only) and minimum barcode quality based on the intended application or scan environment. GS1 normatively references ISO/IEC barcode test specification for determining the quality measurements:

- *ISO/IEC 15415: Information technology; automatic identification and data capture techniques; bar code print quality test specification; two-dimensional symbols.*

- *ISO/IEC 15416: Information technology; automatic identification and data capture techniques; bar code print quality test specification; linear symbols.*

Each time a linear or 2D barcode is evaluated, a verifier apparatus measures numerous characteristics that are compiled to arrive at an overall score between 0.0 and 4.0. 2D barcodes quality standards uses the following compliance factors:

Decode

This verification leverages the reference decode algorithm defined by ISO/IEC for decoding the 2D barcode. If there is a valid decode, the grade is 4.0. If the barcode cannot be decoded, the grade is 0.0.

Figure 7.3.1-1



Symbol contrast

The symbol contrast is the difference between the darkest and lightest areas of the barcode. This is measured in percentage terms, and the percentages are converted into five different bands – 4,3,2,1, or 0.

Axial non-uniformity

Most 2D barcodes should be square with evenly spaced elements. Axial non-uniformity is a measure of how out of square the barcode is when checked against its horizontal and vertical axes. This is measured and then graded from 4 to 0.

Modulation

A barcode should be evenly dark and light across 2D barcode. Modulation compares the least dark-to-light area of the symbol to the greatest difference between the dark and light elements. This is measured and then graded from 4 to 0.

Grid non-uniformity

Grid non-uniformity measures how the symbol is distorted in terms of how much the implied x and y axes are not at an angle of 90. It is in effect measuring how twisted the image is.

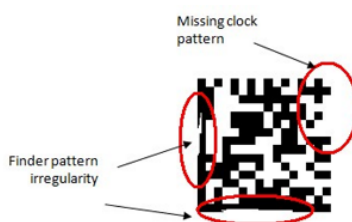
Unused error correction

All 2D barcodes include error- correction characters that may be used to reconstruct damaged parts of the symbol. A perfect symbol will not require any use of the error-correction characters and will receive a top grade of 4.0. The parameter is measured and then graded from 4 to 0.

Fix pattern damage

The fixed patterns of a 2D barcode are used by the scanner to find the barcode. If any of these are damaged the barcode will be more difficult to read, so any damage is measured and graded from 4 to 0.

Figure 7.3.1-2



The Symbol Specification Tables (SST) minimum quality grade for 2D barcodes symbols is shown in this format:

1.5 / 12 / 660

- Where-

- 1.5 is the overall symbol quality grade.
- 12 is the measuring aperture reference number (corresponding to a 0.30 millimetre or 0.012 inch diameter aperture).
- 660 is the peak response wavelength (lighting) in nanometres. In addition to the print quality grade, all elements in the separator patterns **SHOULD** be visually distinguishable. GS1 DataMatrix barcode creation (Labels)

In the creation of 2D barcodes you have four primary categories:

1. **Open-source** code refers to software whose source code is made available to the public, allowing anyone to view, use, modify, and distribute the code.
2. **Software Development Kit (SDK)**, is a set of software tools, libraries, documentation, and sample codes provided by a software vendor to assist developers in creating applications for a specific software framework, platform, or hardware device. The availability of an SDK simplifies the development process by providing pre-built functionalities, tools, and resources that developers can leverage.
3. **Commercial label design software** is specialized software used for creating and printing labels in various industries. These tools offer advanced features and capabilities for designing labels, barcodes, and RFID (Radio-Frequency Identification) tags. Some common features for commercial label design include:
 - a. Label Template Design: advanced label design capabilities, allowing users to create complex labels with graphics, text, barcodes, and other elements.
 - b. Data Integration: integration with databases and business systems enables dynamic data on labels, ensuring accuracy and efficiency.
 - c. Compliance: these tools often comply with industry standards like GS1 and regulations, making them suitable for businesses with specific labelling requirements.
 - d. Automation: solutions support automation to streamline label printing processes and reduce manual effort.
 - e. User Support: commercial software typically comes with support services, documentation, and user communities to assist users in optimizing their label design and printing workflows.
4. **Printer manufacture software**, solutions are provided by printer manufacturers for the management and control of their printing equipment. These solutions are commonly designed to offer:
 - a. Centralized Control: for managing multiple printers from a single interface, enhancing efficiency, and reducing errors.
 - b. Integration: these solutions often offer integration capabilities with enterprise systems, databases, and other production-related software for seamless data exchange.

- c. Job Management: job scheduling and management features enable users to optimize printing processes and streamline production workflows.
- d. Compliance: designed to comply with industry standards and regulations related to coding, marking, and labelling.
- e. Remote Monitoring: allows users to oversee printing processes and diagnose issues, contributing to proactive maintenance and minimized downtime.

7.3.2 GS1 DataMatrix barcode creation considerations

When creating a GS1 DataMatrix barcode consideration for the data to be encoded based on information detailed in Section Figure 6.3.2-1 Common GS1 Application Identifiers and the Symbol specification table 11 – GS1 GSRNs for GS1 DataMatrix barcode scanning applications within the GS1 General Specifications - <https://ref.gs1.org/standards/genspecs/> (the range of X-dimension allowed for the Global Service Relation Number and associated attributes) will determine the size of the physical barcode; a decision by the implementer can then be made as to whether the barcode will fit into the area for the proposed printing of the barcode.

7.4 Printing

Once the GS1 DataMatrix barcode's data and encoding have been optimised, the next step is printing the barcode. The chosen method of printing will depend on the size of the barcode, the speed of printing required, the type of substrate and whether the data encoded is static or dynamic (changing).

7.4.1 The major printer technologies used in patient identification

The two main printing technologies used for printing barcoded wristbands / identity bands and other labels that are then applied to patient information documents are "thermal transfer" and "direct thermal" and these are explained as follows:

Thermal Transfer: A printing method where a thermal print head applies heat to a ribbon, transferring ink onto the substrate, usually label or film. It is commonly used for high-quality and durable printing, such as 2D barcodes on labels.

Direct Thermal: This method uses heat-sensitive paper or label stock. When the thermal print head applies heat, it activates the chemicals in the paper, creating characters or barcodes. It is often used for shorter life span 2D labelling applications.

For more information on these two printing technologies, their use, speed and quality of the barcode printing, substrates used and other considerations please refer to the following information: <https://ref.gs1.org/guidelines/2d-in-retail/#h-thermal-transfer-and-direct-thermal>

7.4.2 GS1 DataMatrix barcode printing considerations

Each printing technology has advantages and limitations based on requirements such as maximum height, print resolution, speed of print, substrate to be printed on, the printing environment, and the expected 2D barcode durability. Section 8 - Appendix details what you need to know for all of the above printing technologies.

It is key to ensure sufficient contrast between the 2D barcode and the background colour of the material being printed on. High contrast enhances readability and scanning accuracy. Surfaces with a sheen can reflect light and affect what the scanner can decode and therefore should be avoided.

7.5 Scanning

Imaging scanners are engineered to accurately decode 2D barcodes, tailoring their performance to meet diverse application requirements. These specifications encompass factors such as the module size of the 2D barcode, the scan rate, the context in which the barcode is being decoded—whether for positive patient identification, point-of-care medicine management, or general distribution. The environmental conditions, including lighting, dust levels, and moisture presence are also important

design considerations. The GS1 General Specifications provide the barcode's X-dimensions (bar width or module size), minimum height (linear barcode only) and minimum barcode quality based on the application standard's scan environment.

See symbol specification addendums Symbol specification table 11 – GS1 GSRNs for GS1 DataMatrix barcode scanning applications within the GS1 General Specifications.

<https://ref.gs1.org/standards/genspecs/>

Major imaging scanner types include:

- **Handheld scanners** are portable devices held by the user for scanning barcodes. They are versatile and can be used in various industries, including healthcare, retail and logistics.
- **Mobile scanners** are portable devices, often integrated with mobile computers or smartphones. These scanners are ideal for applications where mobility is crucial, such as inventory management, field service, or asset tracking. They may use built-in cameras for 2D barcode scanning.
- **Smart device scanners** refer to barcode scanning functionality integrated into smartphones or tablets. Modern smartphones come equipped with built-in cameras capable of scanning barcodes. Apps and software leverage the camera to capture and decode barcode information. This approach is common for inventory management and consumer engagement applications.

7.6 Verification

A barcode verifier is a specialised device designed to assess and grade the quality of printed barcodes. Unlike barcode scanners that are focused on reading barcodes for data capture, verifiers are specifically used to ensure that a printed barcode meets industry standards, and the barcode is encoded with a compliant data structure.

Verification scanners are generally used as offline auditing devices and have portable or desktop models to test for all barcode quality requirements. Inline fixed verification scanners are becoming more popular and allow manufacturing to track the quality of every barcode in real time, however they may not test all quality requirements.

Common features of barcode verification scanners include:

- **Verification grades** or quality assessment of the barcode based on industry standards, such as the ISO (International Organisation for Standardization). Verification scanners analyse various aspects of the printed barcode, including line contrast, edge contrast, symbol contrast, and quiet zones. These factors contribute to the overall print quality and readability of the barcode. See Section 5.12.5 Quality assessment in the GS1 General Specifications - <https://ref.gs1.org/standards/#genspecs> for barcode quality parameters used in verification processes.
- **Compliance checking** of the printed barcode's compliance with specific symbology standards, encoding rules, and dimensions.
- **Data accuracy** of the encoded data within the barcode. This ensures that the information encoded in the barcode matches the intended data structure.
- **Reporting and documentation** about the quality of the scanned barcode. This information is valuable for quality control and compliance and troubleshooting purposes.

7.6.1 Barcode verifier considerations for GS1 DataMatrix use in healthcare

For verification grades and compliance checks, the GS1 General Specifications provide the barcode's X-dimensions (bar width or module size), minimum height (linear barcode only) and minimum barcode quality based on the application standard's scan environment. See symbol specification addendums for table 11 for GS1 DataMatrix healthcare applications using the GSRN. GS1 normatively references ISO/IEC barcode test specification for determining the quality measurements:

- *ISO/IEC 15415: Information technology; automatic identification and data capture techniques; bar code print quality test specification; two-dimensional symbols.*

- *ISO/IEC 15416: Information technology; automatic identification and data capture techniques; bar code print quality test specification; linear symbols.*

For data accuracy of the GS1 element string syntax refer to the GS1 General Specifications
<https://ref.gs1.org/standards/genspecs/>

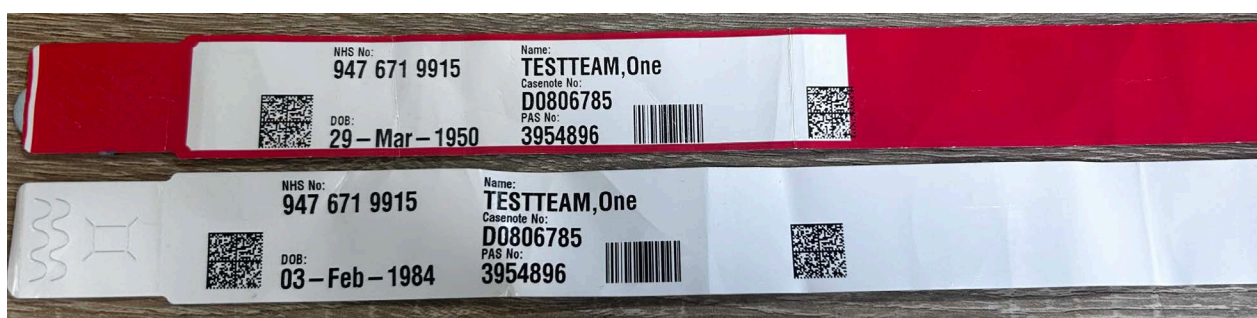
8 Appendix

8.1 Patient wristband examples from existing implementations

This section displays examples of implemented wristbands from around the world, some use GS1 barcodes for the “Verification of Patient Identification” and typical data sets used and others show the use of proprietary data sets and the use of non-GS1 barcodes.

Not all human readable text, will be encoded in the barcode. However if the data is encoded in the barcode, it must match the human readable text displayed.

- ✓ **Note:** The following data sets detailed are as accurate as possible, but before any implementation it is best to check with the local country authority to ensure they are accurate.
- England (National Health Service - NHS)
 Family Name, Given Name, Biological Sex, Date of Birth (DOB), GSRN, Local Hospital Identifier



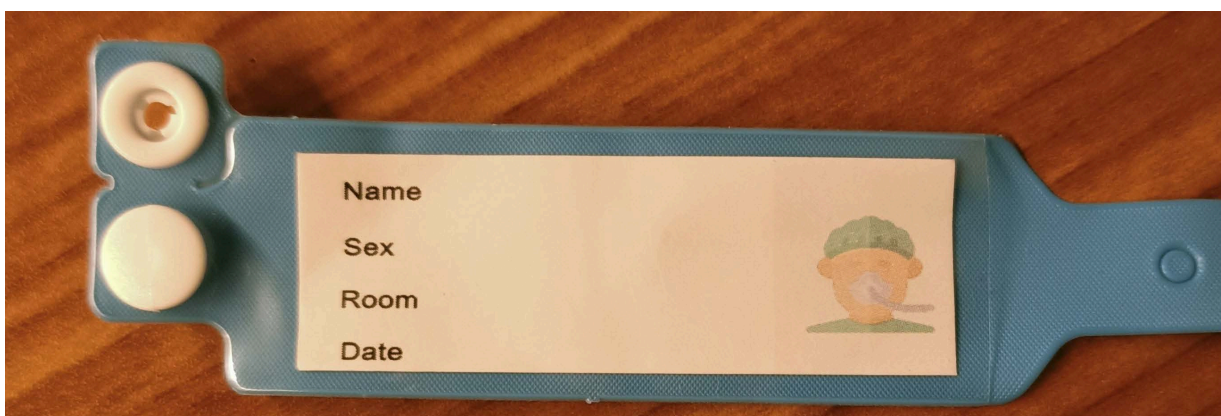
- Ireland (Health Service Executive – HSE)
 Family Name, Given Name, Biological Sex, Local Hospital Identifier, GSRN, Global Location Number (GLN), DOB and SRIN
- United States of America:
 - Given Name, Family Name, Preferred Name, Admission Date, DOB, Age, Biological Sex and CSN Number (Contact Serial Number)
 - Given Name, Family Name, Middle Name, Date of birth, Age, Gender, Admission Date, Medical Record Number (MRN), Encounter Number, Entry department e.g. emergency.



- ✓ **Note:** Contact Serial Number (CSN) identifies a particular encounter for a subject of care (patient)
- Australia – Medical Record Number (MRN), DOB, Sex, Family Name, Given Name and Admission Date



- Egypt – Name, Sex, DOB / Date of Admission and Treatment location, no barcode used at present.



- New Zealand – Patient case number and Patient Name
- Saudi Arabia – No barcode, just medical record number (MRN), DOB, Sex and full name.

8.2 GS1 barcode examples using existing GS1 Application Identifiers

The following examples show example data sets using a range of current GS1 Application Identifiers for the purposes of “Supporting the verification of patient identification” using a variety of patient demographic identifiers alongside the Global Service Relation Number (GSRN), Service Relation Instance Number (SRIN), AIDC Media Type and the Version Control Number (VCN).

Figure 8.3-1 Details a fictional patient “Jane Bond” who was born on the 5th January 1976, the patient is a female and lives at 164 North Dutton Street, Santa Monica, California, USA.

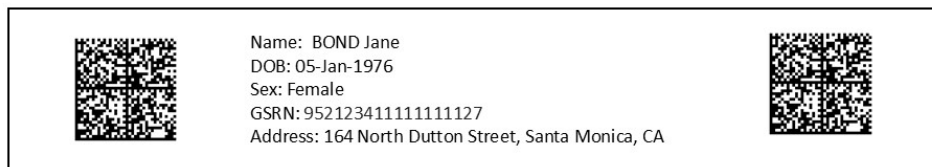
Figure 8.3-2 Details a fictional patient “James Bond” who was born on the 7th January 1996, the patient is a male.

- ✓ **Note:** Figure 8.3-3 Details a fictional patient “James Bond” who was born on the 7th January 1996, the patient is a male and this patient has an identified allergy or has other special considerations (hence the red border around the patient information).

The use of “red” coloured wristbands vary by jurisdiction, some regions and authorities detail its specific use for specific patient scenarios and a such any information regarding this requirement should be sourced from your local health authority.

Regulations from local regions may define specific data sets to adopt and implement and as such may vary from examples detailed.

Figure 8.3-1



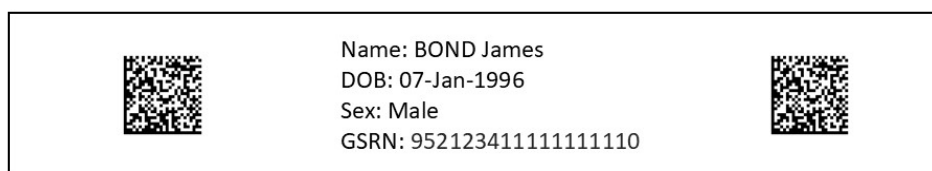
Decoded information:

]d28018952123411111111127<GS>8019123<GS>725019760105<GS>72522<GS>7253Bond<GS>7254Jane<GS>7257164+North+Dutton+Street,Santa+Monica,CA

Human Readable Interpretation (HRI)

(8018)95212341111111127(8019)123(7250)19760105(7252)2(7253)Bond(7254)Jane(7257)164+North+Dutton+Street,Santa+Monica,CA

Figure 8.3-2



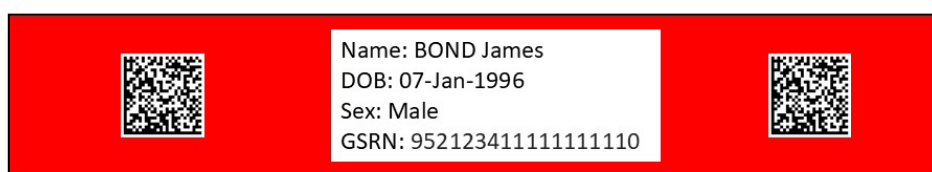
Decoded Information:

]d28018952123411111111110<GS>801912345<GS>725019960107<GS>72521<GS>7253Bond<GS>7254James

Human Readable Interpretation (HRI)

(8018)95212341111111110(8019)12345(7250)19960107(7252)1(7253)Bond(7254)James

Figure 8.3-3



Decoded Information:

]d28018952123411111111110<GS>801912345<GS>725019960107<GS>72521<GS>7253Bond<GS>7254James

Human Readable Interpretation (HRI)

(8018)95212341111111110(8019)12345(7250)19960107(7252)1(7253)Bond(7254)James



Note:]d2 is the symbology identifier for a GS1 DataMatrix barcode – See Section 5.1.3 of the GS1 General Specifications for detailed information on this subject -

<https://ref.gs1.org/standards/genspecs/>

9 Reference Material

- Point of care scanning
<https://youtu.be/mgsM04nx5E8>
- GS1 DataMatrix - A tool to improve patient safety through visibility in the supply chain
https://www.gs1.org/docs/healthcare/MC07_GS1_Datamatrix.pdf
- GS1 DataMatrix Guideline - Overview and technical introduction to the use of GS1 DataMatrix
<https://www.gs1.org/standards/gs1-datamatrix-guideline/25#1-Introduction-to-GS1-DataMatrix>
- GSRN Executive overview
https://www.gs1.org/docs/idkeys/GS1_GSRN_Executive_Summary.pdf
- Good morning, Mr. Jones, here is your medication, GS1 Standards for precise patient identification
https://www.gs1.org/docs/healthcare/MC10_GS1_Patient%26CaregiverID_lowdef.pdf
- GS1 General Specifications (latest version)- <https://ref.gs1.org/standards/genspecs/>
 - Supporting the verification or validation of a subject of care (patient) – Section 2.5.4 of the GS1 General Specifications – Release 26.0 January 2026
- Barcode scanner environment and printing methods – factsheet - [GS1_Barcodes_Fact_Sheet-Scanner_enviroments_and_printing_methods.pdf](#)