

The logo for the National Casemix Office features the text "National Casemix Office" in a white, sans-serif font. The text is positioned to the right of a white graphic element consisting of a vertical bar on the left, a horizontal bar at the top, and a rounded corner on the right side.

**National  
Casemix Office**

# **The Science of Casemix**

January 2022

**We support NHS staff at work, help people get the best care, and use the nation's health data to drive research and transform services**

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This report may be of interest to members of the public, policy officials and other stakeholders to make local and national comparisons and to monitor the quality and effectiveness of services.

**Author:** National Casemix Office

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## The Science of Casemix

The term casemix has a number of meanings, from the literal “mix of cases (patients)” seen by a consultant/hospital/region, to the way in which patient care and treatments are classified into groups. These groups provide a useful measure on which to make performance comparisons, to cost healthcare, or indeed to fund it.

The principles of the development of a casemix classification are well-established internationally and have been since the late 1960s. These are generally accepted to require a casemix classification (often referred to as Casemix Groups) to be:

- clinically meaningful
- relatively similar at the group level, in resource terms
- based on mandated, standardised, and readily available data, and
- manageable in number.

From a practical perspective, casemix groups reduce the administrative and analytical burden of those who use them. That said, they will never be accepted in a healthcare setting if clinicians do not recognise the care the groups describe. The key casemix benefits of being able to compare performance, activities, and patients, will never be realised if the data which underpin them is subject to local definitional changes, or the contents of the groups is so dissimilar as to make any comparison meaningless.

## The National Casemix Office

The National Casemix Office (NCO) was established in 1994 in Winchester, to enable an improved understanding of healthcare activities provided to patients, at local, regional, and national levels.

Today's NCO is based in Leeds and is currently hosted by NHS Digital. It is made up of a small team of Casemix specialists.

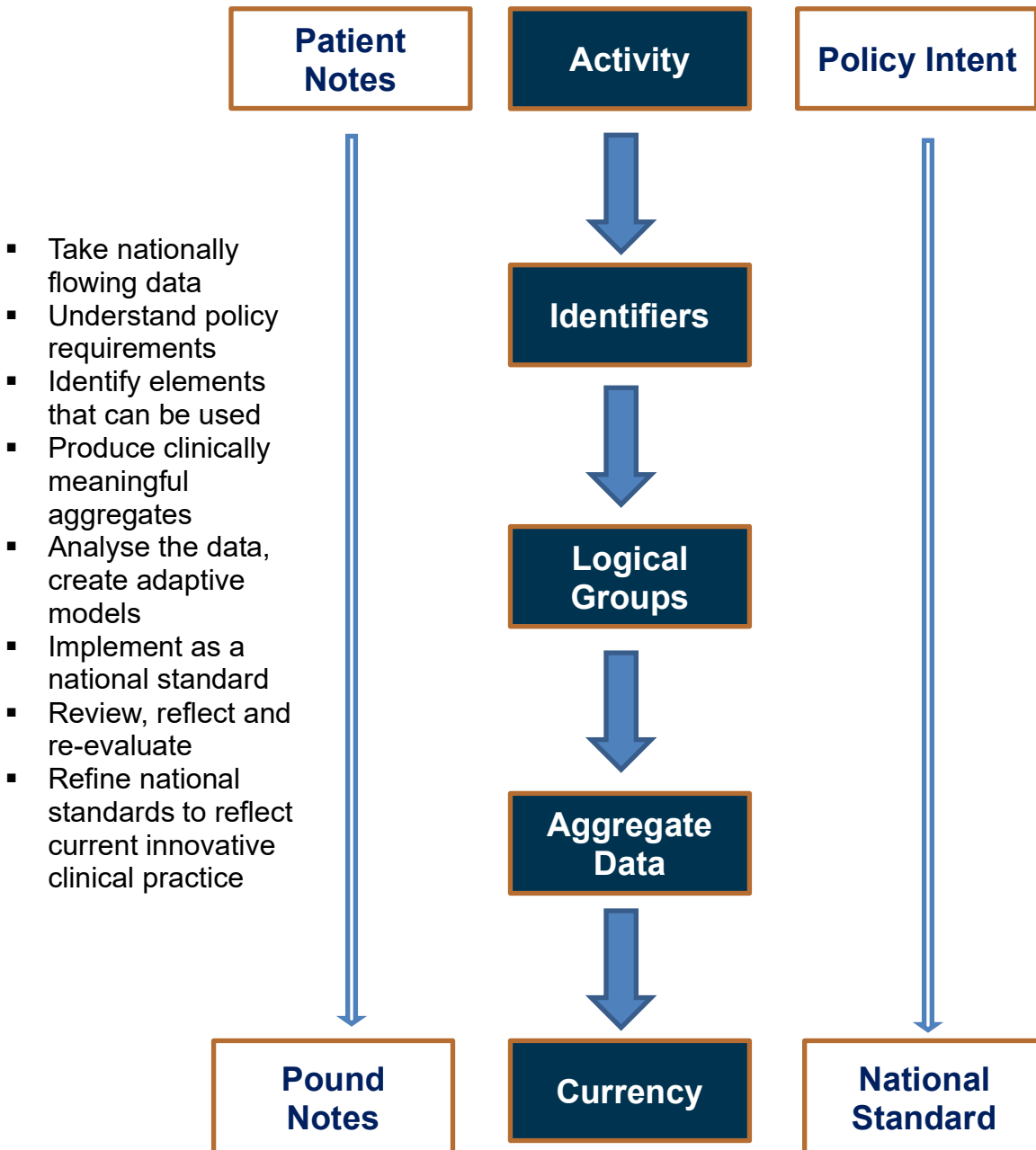
The team is led by Paula Monteith, a Chartered Management Accountant with over twenty years' experience working in the NHS and policy. Paula represents the NCO internationally as Treasurer and member of the Executive Committee of *Patient Classification Systems International (PCSI)*, which is a global non-profit making organisation focusing on all aspects of casemix-based classifications, analysis, and financing.

The NCO has been providing world class casemix expertise for more than two decades, covering both Healthcare Resource Group (HRG) design and development, and healthcare activity groupings. The team ensure that the finance, planning and commissioning needs of the NHS are incorporated into the casemix designs, both current and future.

Casemix classifications have existed in the English NHS since the early 1990s and are used by the NHS to cost their healthcare activities, and by policy to reimburse healthcare providers for the activities they undertake.

The HRGs created by the NCO are used in the current national costing and reimbursement systems throughout England, for acute patient care. In 2012/13 the team introduced the latest design known as HRG4+, which has gained international acknowledgment for its innovative approach to the recognition of specialised care and patient morbidity.

# Casemix as a Methodology: Creating Currencies for Costing and Funding



## How Casemix Designs Work

In the UK, all healthcare activities are coded using information standards, primarily relating to diagnoses<sup>i</sup> (what is wrong with a patient) and procedures<sup>ii</sup> (what is done to a patient). In 2022, there are more than 25,000 codes that can be used to describe diagnoses and procedures, and the possible combinations of these that could rightly be recorded in a patient record is vast.

In addition, certain elements of patient care may be recorded using other data elements which interface with patient admissions, such as the Critical Care Activity Codes used for Critical Care Services in the Minimum Data Sets or the Investigation and Treatment codes used by Emergency Departments in the Emergency Care Data Set.

The NCO are therefore commissioned by Policy to develop and maintain a set of Casemix groupings, called Healthcare Resource Groups (HRGs), which can be used to provide a clinically-endorsed view of acute healthcare activities undertaken within the English healthcare system.

These are known as the Casemix Designs and are used for both Costing and Payment. The NCO publish details of each design on their website, and this includes publication of the software product, called a Grouper, which takes patient activity as the input and applies the design rules, to output clinically-relevant HRGs.

HRGs for admitted patient care can be most simply understood as being either diagnosis or procedure-driven;

### Diagnosis-driven HRG example;

ICD-10: **M54.90** Dorsalgia, unspecified: Multiple sites in spine

Adult: Age 19 and over

HRG4+: **HC27N** Degenerative Spinal Conditions without Interventions, with CC Score 0-2

Child: Age 18 or under

HRG4+: **PH34D** PH34D Paediatric, Musculoskeletal or Connective Tissue Disorders, with CC Score 0

### Procedure-driven HRG example;

(With a valid primary diagnosis and any patient age)

OPCS: **V37.3** Transoral fusion of atlantoaxial joint

HRG4+: **HC63C** Major Extradural Spinal Procedures with CC Score 0-1

A casemix classification needs relatively few inputs in order to work effectively. In principle, it needs some way of differentiating between patients, and some way of measuring difference in resource use.

Identifying subsets of a patient population who are expected to use similar resources, and then comparing the resources actually used in patient care, enables hospitals to start to understand where differences in care provision lie.

Benchmarking and comparison at this level will never explain why care provision apparently differs – only that it does. It therefore provokes, rather than answers, questions.

The HRG4+ classification, like its international counterparts, makes use of the following patient and care attributes to differentiate healthcare admission activity:

- Diagnoses (primary and secondary)
- Procedures and interventions
- Age
- Length of stay
- Administrative events – such as admission method, source of admission, discharge destination, discharge method, and Speciality (Main Specialty Codes and/or Treatment Function Codes)

The HRG4+ classification is therefore entirely reliant upon the contents of a patient record. Inaccurate data will lead to spurious and illogical HRG outputs; truly inaccurate data may lead to a misrepresentation of the service provided, the costs of that provision or the income a provider receives.

With each release of an NCO Grouper, we also publish Chapter Summaries as part of the documentation suite. The Chapter Summaries provide an overview of each HRG subchapter and its content and scope.

In addition, the documentation suite includes a Code to Group Excel file. This workbook provides details of constituent elements that contribute to HRG grouping. It contains reference data, such as the ICD-10 and OPCS-4 codes used in the design, procedure and diagnosis hierarchies relevant to a specific design, and the Complication and Comorbidities lists for HRG subchapters. It also includes information on Programme Budgeting Category (PBC) mapping and a comprehensive list of HRG codes and labels.

Finally with each release, we publish a Summary of Changes document that details the pertinent major design and Grouper changes from the previous relevant release.

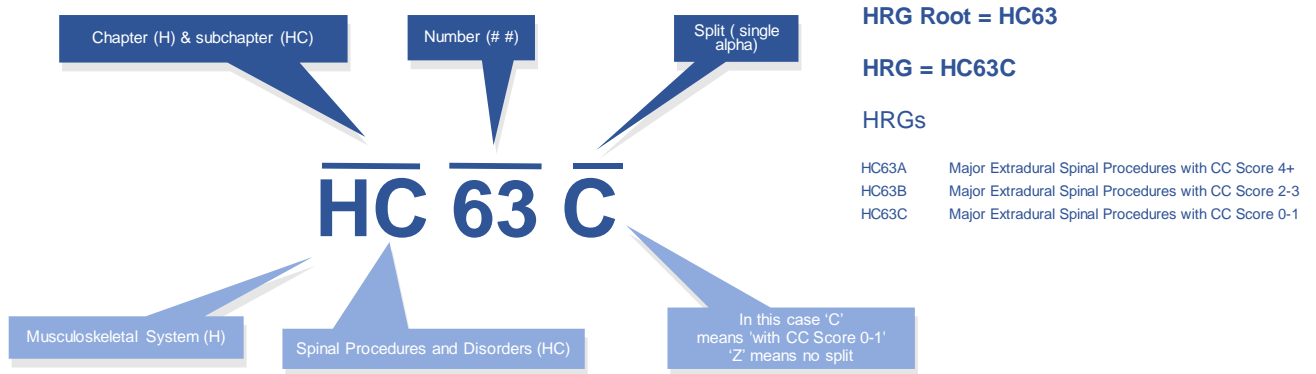
These documents and all our software products can all be found on the National Casemix Office website;

<https://digital.nhs.uk/services/national-casemix-office>

# The Format of an HRG

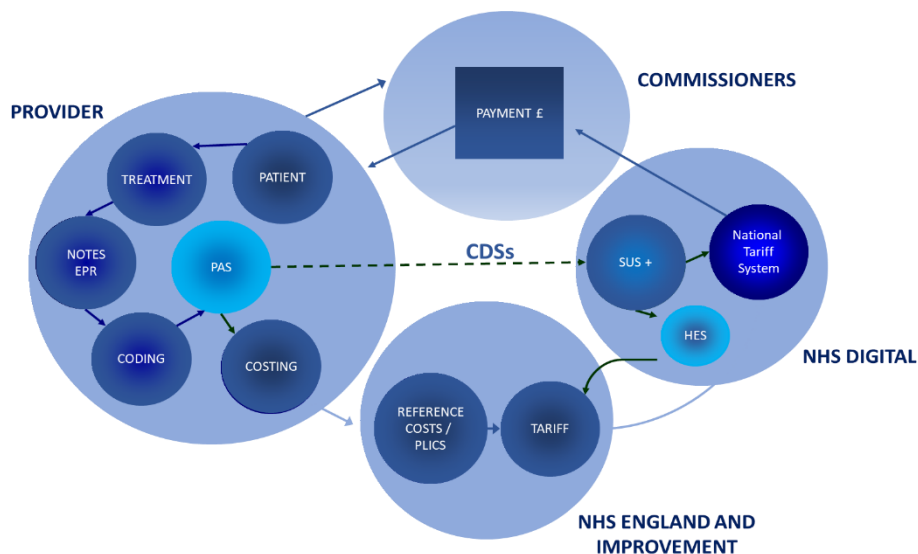
The diagram below shows the format of an HRG, illustrating the 5 character code structure. The final character split within the HRG is a single character code that further describes activity, such as patient age, length of stay or the presence of complications and comorbidities. Other than the value of “Z”, indicating that no split is present, split characters are not standardised across the HRG design.

## HRG HC63C Major Extradural Spinal Procedures with CC Score 0-1



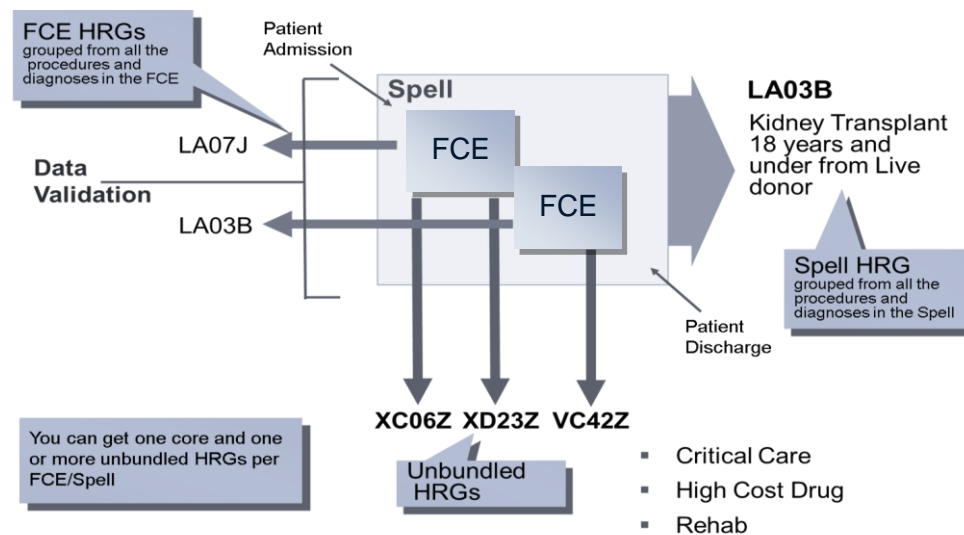
# The Operating Environment

The schematic below depicts how data flows in the national costing and reimbursement system. From patient presentation to coding via notes and into the commissioning data sets, the data from the Provider Patient Administration System (PAS) can flow to the “centre” or directly to local or national commissioners, enabling costing, reimbursement, or locally agreed contracting.



## Grouping Outputs: Episode vs Spell HRGs

The diagram below illustrates how multiple HRGs can be generated from data flowing in the CDS's for a single patient admission (spell). The episode is made up of 2 Finished Consultant Episodes (FCEs) following a change in consultant responsibility. Activity is paid at the spell level and costed at the episode level. In addition, the activity generates unbundled HRGs, which are costed, and may be reimbursed separately.



## Casemix Implementation in England

There are data standards<sup>iii</sup> regarding the information that healthcare providers must legally record about their patients, and rules governing what they must submit via the Commissioning Data Sets (CDS)<sup>iv</sup> to NHS Digital, for central collection and processing.

Patient notes need to be accurate for a variety of reasons, most importantly to facilitate optimal patient care. Badly written or incomplete notes will negate the ability of coders to translate clinician's notes into standardised codes (for diagnoses and procedures) for patient management, internal review, or indeed onward transmission to NHS Digital.

Poor local administration systems may result in an inability to accurately capture additional information about a patient which may be vital for establishing where a patient came from, where they went or what happened to them whilst they were under the care of a consultant. They may also lead to an inaccurate representation of the costs of the care provided.

Many NHS providers in England use the PAS as a basis for counting the activity they cost under the mandated annual National Cost collections<sup>v</sup>. These costs, in turn, currently form the basis of the National Tariff<sup>vi</sup>, meaning that poor data recording at a trust level can not only affect the national cost collection, but also the future funding of the NHS.

Coding and data capture that is relevant, accurate and reflective of the patient care actually provided is therefore fundamental.

*.... And it ensures that the HRGs function as designed, and appropriately reflect the intent of those clinicians who developed them*

## Clinical Input

HRGs are designed by clinicians to represent clinical care, within the boundaries of available, nationally mandated data.

Clinical Leads on Casemix Expert Working Groups (EWGs) are nominated representatives of the Royal Colleges and Professional Bodies within the UK and are joined on EWGs by Finance and Informatics professionals, to ensure that the HRGs can be practically implemented within the current national system. Our EWG members are not reimbursed for the time or expertise they provide.

Given that the HRG structure is currently aligned with patient body-systems, for both surgical and medical activities, there are in excess of 30 EWGs that input into the development of the HRG Casemix Classification, representing both specialist and routine patient care.

## In Summary

Clinical input and experience has allowed the current HRG4+ classification to acknowledge the additional resource use required when treating patients who:

- Have multiple complications and comorbidities that affect the clinical input for their care
- Require surgery at a very young age
- Require multiple procedures to be undertaken at the same time, within the same hospital admission or attendance
- Require surgery that utilises new devices, or innovation in traditional clinical approaches
- Require more complex, rather than routine, care.

Such developments ensure that the HRG Casemix design not only retains its clinical relevance and viability within the English NHS, but that it continues to retain its status as best in class from an international perspective.

# Debunking The Myths

*Myth: OPCS procedures codes cannot be updated to reflect innovations in clinical care*

There is an OPCS portal<sup>vii</sup> which can be used to request additional OPCS codes. These are currently scheduled to be updated every three years. OPCS-4.9 came into effect in April 2020, and the next scheduled update (OPCS-4.10) is planned for national implementation in April 2023.

*Myth: ICD-10 codes for diagnoses are not updated regularly in the UK*

ICD (diagnosis) codes are updated on a regular cycle. The last scheduled update (ICD-10 5<sup>th</sup> Edition) was implemented in April 2016<sup>viii</sup>, with emergency updates released in 2020 in respect of the COVID-19 pandemic. Further updates to ICD-10 are currently paused whilst consideration is given to the implementation of ICD-11.

*Myth: HRG content is not transparent*

Every Grouper release by the NCO includes a comprehensive documentation suite<sup>ix</sup> which provides full details of HRG design changes from a previous design iteration (the Summary of Changes word document), as well as a mapping of code content from OPCS/ICD-10 etc. to HRG (Code to Group Excel file), including the logics required to generate specific and particular HRGs.

*Myth: HRG output cannot be compared across different Grouper releases*

Comparing HRG output across Grouper years requires processing the data using two or more Groupers. To facilitate grouping of patient records to HRGs, a Grouper User Manual is published, that provides full details of data input requirements.

All publicly released Groupers are available to download from the NCO website, to enable year-on-year comparison for benchmarking and performance measurement of healthcare activities.

*Myth: HRGs are not relevant to clinicians*

HRGs are designed by practising clinicians who are themselves nominated representatives of Royal Colleges and Professional bodies within the UK. Clinicians who require further clarification on HRG designs should approach their EWG representative in the first instance.

HRGs provide an aggregate level to start to understand the cost and funding implications of clinical decisions. HRG analysis will not provide answers; it will highlight differences which will need to be understood at a sub-HRG, often patient level, within a healthcare provider.

*Myth: The HRG4+ Classification unduly rewards providers who “code more”*

All HRG output relies on reliable and accurate coding of patient care, that complies with nationally mandated coding standards for the year in question, and which is subject to both internal and external coding audits.

The HRG4+ design uses additive logic to determine the level of complications and comorbidities (CCs) that a patient has, simply coding more secondary diagnoses does not necessarily mean that this will impact upon the HRG generated. The CC lists for each HRG Subchapter are designed by the Expert Working Groups to ensure that only clinically relevant CCs, by patient body-system, are recognised in HRG generation. Duplicate or less specific secondary diagnoses do not contribute to the “CC score” for a patient record.

Full details of the CC lists used in the HRG casemix classification can be found in the relevant Code to Group Excel workbook documentation for each Grouper.

*Myth: The HRG Classification does not take account of multiple procedures*

For surgical activity, the HRG output for a patient will depend upon the dominant procedure recorded in a patient record. This is determined by the use of a procedure hierarchy, full details of which are published in the Code to Group Excel workbook for each Grouper.

Where it is common for patients to undergo multiple procedures within the same healthcare admission or attendance, the HRG design reflects this. HRG4 included HRGs that were clinically designed to reflect the fact that the resource use of undertaking two or more procedures at the same time can outweigh the resources required to undertake any one of them in isolation. HRG4+ expanded this recognition of multiple procedures across more HRG Subchapters where clinically relevant to do so.

*Myth: The HRG classification causes volatility in income*

It is unfeasible that changes to an aggregate casemix classification alone could cause volatility in income. Changes to activity bases can be as a result of changes to actual activity levels at a local or regional level between years, or coding depth, or quality. As future income is currently dependent on both counting and costing quality in a previous year, improvements in costing can result in cost shifts between casemix classifications that are outwith the enhancements of the casemix classification itself. Changes to the HRG design to better represent the differences between complex and routine care, or the resource differential between treating children and infants, can more effectively represent the resource required to deliver high-quality patient care. This is not volatility; it is a purposeful improvement in assuring that resources reflect emerging and apparent patient need.

***If you need any further information – just get in touch with the team***

Any and all enquiries should be directed to NHS Digital enquiries email address [enquiries@nhsdigital.nhs.uk](mailto:enquiries@nhsdigital.nhs.uk) marked for the attention of the National Casemix Office.

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- i [NHS Classifications ICD-10 - TRUD \(digital.nhs.uk\)](#)
  - ii [Clinical Classifications - NHS Digital](#)
  - iii [Information standards - NHS Digital](#)
  - iv [Commissioning Data Sets - NHS Digital](#)
  - v Costing publications available at: [NHS England » National Cost Collection for the NHS](#)  
Costing Guidance available at: [NHS England » Approved Costing Guidance](#)
  - vi [NHS England » National tariff payment system](#)
  - vii <https://isd.digital.nhs.uk/rsp-opcs/user/guest/home.jsf;jsessionid=818C8E9C7386171AE39C10362B21CF4E>
  - viii [https://classbrowser.nhs.uk/ref\\_books/ICD-10\\_2021\\_5th\\_Ed\\_NCCS.pdf](https://classbrowser.nhs.uk/ref_books/ICD-10_2021_5th_Ed_NCCS.pdf)
  - ix The Home Page for all Casemix Reference Material, including Grouper Software can be found at:  
<https://digital.nhs.uk/services/national-casemix-office>

This publication may be requested in large print or other formats.

For further information

**[www.digital.nhs.uk](http://www.digital.nhs.uk)**

**0300 303 5678**

**[enquiries@nhsdigital.nhs.uk](mailto:enquiries@nhsdigital.nhs.uk)**

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