Supplementary Table 1: Full process for data linkage using pseudonymised data across the national databases in this study

Steps	Detailed process

Step 1 – **Extracting data for pseudonymisation**	A team of information specialists within NHS Wales Informatics Service (NWIS) retrieves data using three sets of queries, to produce 3 tables, as described below.
	
	• **Data from National Data Resource (NDR) system**:
	   o Date and time whereby the Electronic NHS Alert Service (ENAS) email was sent to the community pharmacy
	   o A unique identifier for the Discharge Advice Letter (DAL) document used by the NDR database
	   o The email address where the ENAS notification was sent
	   o Success or failure status of the community pharmacy picking up the notification
	
	• **Information in the DAL**:
	   o The unique identifier for the DAL document used by the NDR database
	   o The primary key for the Document Notification Table (PK). An integer assigned sequentially.
	   o 10-digit identifier for an individual patient
	   o The date and time that the DAL is posted to the *Choose Pharmacy* database and hence available to the community pharmacist within the *Choose Pharmacy* application
	   o The date and time that the DAL is opened by the community pharmacist within the *Choose Pharmacy* application
	   o The type of document made available (currently only DAL)
	
	• **Information in *Choose Pharmacy***:
	   o The ID of the DAL used in the consultation (FK)
	   o The primary key for the Discharge Medicines Review (DMR) table (PK). An integer assigned sequentially.
	   o Boolean Flag to denote whether the consultation has been completed and submitted
	   o Boolean Flag to denote whether DMR Part 2 was completed
	   o If DMR Part 2 was not completed, selection of reason from a drop-down box
	   o The date the patient was discharged from hospital, as recorded within the Choose Pharmacy application
	   o Date and time the DMR consultation was started within *Choose Pharmacy* application
	   o Date and time that part 1 was recorded
	   o Date and time that part 2 was recorded
	
	A final table combines the tables above to create one dataset, edited to include only the relevant data and then sent for pseudonymization.

Step 2 – **Pseudonymising patient specific pharmacy data**	The audit table, containing the patient's NHS number, is sent through the NWIS pseudonymisation service. This service applies a 64-bit blowfish encryption algorithm to the NHS number, and then this value is mapped to a more readable integer format (Pseudonymised ID). This Pseudonymised ID field is common to all other datasets within NWIS' data warehouse, meaning that records can easily be linked at the level of the individual.
Step 3 – Linking of pseudonymised pharmacy data to hospital data	Admissions for each indicated patient were joined together from the specially pseudonymised dataset and Patient Episode Database for Wales (PEDW) using Structured Query Language (SQL), a language which is used to build, navigate and manipulate databases. Using the pseudonymised common identifier within both datasets, the pseudonymised identifiable data which related to those patients who had a referral to the DMR service (detailed in Table 2) was linked with records of admissions within hospital. This created a database with several rows for each patient, which showed all of the DMR information and all the admissions information for each patient (detailing a portion of information about each admission and providing information about the demographics of the patient at that time).
	Assuming that the admission which prompted a DMR must be that which immediately preceded the ENAS notification into the Choose Pharmacy system, readmission was determined by checking the linked dataset for any subsequent admission. This was done using the coding language for excel - Visual Basic for Applications - to create a Macro. Macros are used to automate tasks in excel which work by following inputted rules.
	The pseudonymised dataset made up of DMR service patients was edited to include columns for information on the admission prior to DMR referral and information on the first subsequent admission (if one occurred). The Macro that was used checked the date of the ENAS and filled in details of the initial admission by looking at the linked dataset and recording the admission immediately before this date. It also looked at any admissions immediately after this date (readmission) and noted them down. In this way, a new dataset for analysis was constructed which contained pseudonymised patient information at their initial admission, patient DMR service information and patient information from their first admission occurring after referral to the DMR service (if applicable).