Usage of allergy codes in primary care electronic health records

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Usage of allergy codes in primary care electronic health records: a national evaluation in Scotland

Mome Mukherjee[1,2], Jeremy C Wyatt[3], Colin R Simpson[2] and Aziz Sheikh[2]

[1]Edinburgh Clinical Trials Unit (ECTU), The University of Edinburgh

[2]Asthma UK Centre for Applied Research, Centre for Medical Informatics, Usher Institute of Population Health Sciences and Informatics, The University of Edinburgh, Edinburgh, UK

[3]Wessex Institute of Health & Research, Faculty of Medicine, University of Southampton, UK

Corresponding author

Ms Mome Mukherjee

Senior Data Analyst

Edinburgh Clinical Trials Unit (ECTU) and Asthma UK Centre for Applied Research

Centre for Medical Informatics,

Usher Institute of Population Health Sciences and Informatics

The University of Edinburgh

Doorway 3, Teviot Place,

Edinburgh EH8 9AG, UK

Tel: +44 (0)131 650 3813

Email: mome.mukherjee@ed.ac.uk

Abstract

Background: The UK's NHS intends to move from the current Read code system to the international, detailed Systematized Nomenclature of Medicine Clinical Terms (SNOMED-CT) to facilitate more clinically appropriate coding of conditions and associated risk factors and outcomes. Given concerns about coding behaviour of General Practitioners, we sought to study current coding patterns in allergies and identify lessons for the future migration to SNOMED-CT.

Methods: Data from 2,014,551 primary-care consultations in over 100,000 patients with one or more of 11 potentially allergic diseases (anaphylaxis, angioedema, asthma, conjunctivitis, drug allergies, eczema, food allergy, rhinitis, urticaria, venom allergy and other probable allergic disorders) from the Scottish Primary Care Clinical Informatics Unit Research (PCCIU-R) database were descriptively analysed and visualised to understand Read code usage patterns.

Results: We identified 352 Read codes for these allergic diseases, but only 36 codes (10%) were used in 95% of consultations; 73 codes (21%) were never used. Half of all usage was for Quality and Outcomes Framework codes for asthma. Despite 149 detailed codes (42%) being available for allergic triggers, these were infrequently used.

Conclusions: This analysis of Read codes use suggests that, introduction of the more detailed SNOMED-CT, in isolation, will not improve the quality of allergy coding in Scottish primary care. The introduction of SNOMED-CT should be accompanied by initiatives aimed at improving coding quality, such as the definition of terms/codes, availability of terminology browsers, a recommended list of codes and mechanisms to incentivize detailed coding of the condition and the underlying allergic trigger.

Keywords: allergy, coding, primary care, Read codes, SNOMED-CT

Background

The UK's National Health Services currently use two clinical coding systems: the International Classification of Disease (ICD-10) in hospitals and Read codes in primary care. This parallel use of two different coding systems has historic origins, but results in major challenges to developing a comprehensive electronic picture of overall care provision.(1) Moreover, due to limited detail – particularly in ICD-10 – these coding systems have major gaps.(2)

Given these parallel coding systems and the accompanying coding gaps (which are also present in other disease areas), in 2011 the UK's Standardisation Committee for Care Information officially approved the Systematized Nomenclature of Medicine Clinical Terms (SNOMED-CT) as a "fundamental standard" for the UK, to become the sole supported terminology across primary and secondary care.(3) This move is potentially welcome, but we cannot assume that this action alone will translate into improved coding quality.(4) Also, the wide range of allergic disorders, the fact that these occur across the life course, the frequent comorbidities, and that a number of organ systems can be affected, makes the task of clinical coding in allergy very complex.(5, 6) There is additionally a need to code for the underlying allergenic trigger and any related factors.(7-9) Consideration of extensive differential diagnoses, example gastroesophageal reflux, structural abnormalities of the upper and lower airways, aspiration of a foreign body etc, in clinical practice has also been emphasized by the allergy community.(10)

We sought to describe the allergy codes currently available in primary care and their structures, and then quantify the actual patterns of use of these codes by a large group of general practitioners (GPs) with a view to deriving lessons that should help maximize the benefits of the impending national move to SNOMED-CT and minimise current complexity.

Methods

Identification of allergy codes available in the Read coding system

We used the NHS Clinical Terminology Browser, version-one, to identify Read codedescriptions relevant to any of the following allergic disorders: anaphylaxis, angioedema, asthma, conjunctivitis, drug allergies, eczema, food allergy, rhinitis, urticaria, venom allergy and other potential allergic disorders. The retrieved codes were categorized into allergic or not-allergic using the following criteria: i) since Read codes have a mono-axial hierarchy,(11) all child codes (with more details) listed under a parent allergy code were included, even if these were unlikely to have an allergic basis (e.g. the parent allergy code 'M11.'-'atopic dermatitis and related' and it's child code under 'M110.'-'napkin dermatitis'; ii) conditions commonly seen, investigated or managed by UK allergists, whether IgE-mediated or not, were considered eligible. For example, although most cases of chronic urticaria do not have an underlying IgE-mediated basis, this condition is commonly managed by allergists, so we extracted data on urticaria related codes; and iii) when the parent code did not refer to allergic problems, but a child code referred to an allergy, the child code was categorized as allergy (e.g. parent code 'F4C0.'-'acute conjunctivitis' for child code 'F4C06'-'acute atopic conjunctivitis'). We excluded 'Family history (FH) of asthma' and 'FH: eczema' from categorizing as allergy codes because these did not relate to the person themselves. Two reviewers independently selected the allergy codes; disagreements were resolved by discussion. Cohen's Kappa, calculated using SPSS version-19, showed an interrater reliability of 0.94 (95% CI 0.90-0.97), implying very good agreement.

Structure and classification of codes

Each of these codes were further independently classified using the Read code structure into: i) the type of concept coded; ii) causal allergen; and iii) the level of coding.

Type of concept coded referred to whether the code was used to label a diagnosis, cause of illness, a symptom, family history, history, management, observation, assessment, a test, test-result or for another purpose.

Causal allergens were used to categorize the codes into: food, drugs, animal, bird, fish, insect, plant, microbe, chemical, atmospheric, other specific, non-specific and not-applicable. Causal allergen was "not-applicable" when the codes were for observation or management purposes (example '66G7.-allergic disorder treatment stopped', '66G8.-carries adrenaline preloaded injection pen', '6636. -inhaler technique shown'). "Non-specific" causal allergen was assigned to codes for descriptions where the causal allergen was not specified, such as '3359.-allergy skin test positive' or '663N2-asthma disturbs sleep frequently'. "Other-specific" was applied to codes where the causal allergen was broadly specified, such as '1784.-asthma trigger - emotion' or 'M286.-contact urticaria'.

Level of detail Read codes follow a tree structure where parent codes could have three to one dots and the more specific child codes could have two to no dots. This allowed us to determine the *level of detail* (or granularity) by inspecting the number of dots available after the codes. Codes with no dots indicated that there were no further associated branch codes. Codes with two dots were classified as 'less detailed' (e.g. 'H33..-asthma'), with one dot as 'medium detailed' (e.g. 'H330.-extrinsic (atopic) asthma') and with no dot as 'more detailed' (e.g. 'H3301-extrinsic asthma with status asthmaticus').

Once this process was complete, the usage of each allergy code and the category of codes was determined (see below).

Usage of allergy codes

Read code usage was evaluated through interrogating the Primary Care Clinical Informatics Unit-Research (PCCIU-R) database, from 2003-04 to 2009-10.(12) PCCIU-R is a nationally representative database for Scotland.(13) Data were available from 393 GP practices between 2003-04 and 2006-07, 369 GP practices in 2007-08, 297 in 2008-09 and 239 in 2009-10. The number of patients whose consultations included our list of allergy Read codes were 143,282, 185,848, 189,895, 186,996, 150,885, 127,467 and 108,323 for -the respective individual years. Since more than one code could have been used in one GP consultation, we refer to usage as the number of times codes were used. Screen shots of Read terms available in drop down list, when searched by a keyword in a GP practice, is presented in Figure 1. The main exception to this is the

recording of drug allergies for which a separate electronic health record template exists.

Usage of asthma codes pre- and post-QOF implementation

Since the Scottish Quality and Outcomes Framework (QOF) for asthma (and a range of non-allergic disorders) came into force in 2004-05,(14) a comparison of codes for asthma usage was made between the pre and post-QOF periods.

Ethics and permissions

We received the data in three separate yearly tables: count of use of allergy codes, number of GP practices and number of patients. The governance of PCCIU-R database is covered by their Steering Group committee, who agreed to supply the data in accordance with their standard operating procedures (SOPs). Specific ethics committee approval was not required because PCCIU-R had already obtained blanket ethics permission for studies following their SOPs. We received aggregated data and no further information was sought or linked to these.

Results

Identification of allergy codes available in the Read coding system and their usage

We identified 650 potentially relevant Read codes, of which 352 (54%) were identified as being eligible allergy codes using the criteria and methods above. Of these 352 allergy codes, the biggest disease category coded was for asthma (34% of the total number), followed by "other" (29%), drug allergy (17%), urticaria (5%), food allergy (4%), eczema (3%), anaphylaxis (3%), rhinitis (3%), angioedema (1%), conjunctivitis (1%) and venom allergy (0.3%) (Supplementary web-Table 1).

These codes were used a total of 2,311,843 times over the seven year study period. A cumulative frequency distribution of code usage (Figure 2) shows that 80% of code usage by GPs was associated with only 11 codes (3% of the total number of codes) and 95% usage with 36 codes (10% of the total available codes). In Table 1, the eight greyed codes in the list of most frequently used codes indicate that the QOF asthma codes contributed to 50% of the usage. Usage rates for individual allergy codes varied dramatically: 73 codes (21% of the total) were never used (Table 2), but one code

(0.3% of all codes) 663H ('Inhaler technique – good') accounted for 22%, or nearly one-quarter of all allergy code usage. The two other highly used codes were 663O ('Asthma not disturbing sleep') and 663Q ('Asthma not limiting activities'), with 16% of the total usage each; these three codes (1% of all codes) together accounted for 54%, or over half of all usage of allergy codes by Scottish GPs. The remaining 248 codes (71%) contributed to only 5% of the code usage.

Structure and classification of codes and usage rates for each of these

Our analysis showed a significant mismatch between the numbers of codes available for different clinical concepts and the frequency with which GPs used these.

Type of concept coded: Although diagnostic codes comprised the majority (47%) of eligible codes, these were used only 21% of the time. While observation codes comprised 15% of codes, these were used the most: 65% of the time. For angioedema, conjunctivitis, rhinitis, urticaria and venom allergy only diagnosis codes existed. The remaining codes encoded concepts related to the history (18%), management (5%), tests (5%), causes of illness (4%), assessment (3%), test-results (2%) or other concepts (1%). No symptom codes were identified among the 352 allergy codes. In an analysis to explore the type of code most frequently used for each allergic disorder, we found that observation codes were mostly used in relation to asthma and diagnosis codes were mostly used in relation to drug allergy, eczema and food allergy (Figure 3).

Causal allergen: A drug was the causal allergen in 17.6% of the 352 codes. Specific causal allergens only applied to a small proportion of codes: food (4.8%), atmospheric (1.7%), animal (1.4%), bird (1.1%), insect (0.6%), microbe (0.3%), chemical (0.3%) and fish (0.3%). It was not-applicable in 18.8% codes. In half of the codes, causal allergens were non-specific (42%) or other-specific (7.7%).

The most frequently used allergen codes were non-specific (64%), example '14F1.'-'history of eczema', followed by non-applicable causal allergen codes (30%), example '13Y4.'-'asthma society member'. Codes with drug and food as causal allergen were used 5% and 1% times, respectively. Non-specific causal allergen codes alone were used for angioedema, conjunctivitis and eczema, followed by urticaria (97%), anaphylaxis (83%), other (80%), rhinitis (71%) and asthma (65%).

Level of detail: Most of the codes available were medium detailed (n=191; 54%), then more detailed (n=149; 42%), thus leaving only 12 (3%) less detailed codes. The

availability of medium detailed codes was high in eczema (73%), asthma (68%), drug allergies (58%) and urticaria (56%), and was the only type of code for venom allergy (n=1). More detailed codes were available in conjunctivitis (100%), followed by food allergy (85%), angioedema (75%) and anaphylaxis (63%). Of the 12 less detailed codes, four were for asthma (178..-'asthma trigger', 1O2..-'asthma confirmed', 663..-'asthma monitoring', H33..-'asthma'), and one each was for drug allergy (14L..-'history of drug allergy'), rhinitis (H17..-'allergic rhinitis') and urticaria (M28..-'urticaria') and five for other (14M..-'history of non-drug allergy', 335..-'allergy skin test', 66G..-'allergic disorder monitoring', H35..-'extrinsic allergic alveolitis', M11..-'atopic dermatitis and related').

Turning to usage rates, medium detailed codes were the most frequently used (81%) and more detailed codes were used less (8%). More detailed codes were never used (n=42) despite their availability in: angioedema-67%, rhinitis-50%, other-44%, urticaria-43%, food allergy-27%, asthma-21%, and anaphylaxis-14%. In contrast, all the more detailed codes were used in conjunctivitis, drug allergy and eczema.

Usage of asthma codes pre-QOF and post-QOF implementation

Compared to 2003-04, when QOF was implemented in 2004-05, usage of asthma codes pertaining to allergy remained the same at 118 codes per 100 consultations in both years, ($p>0.05$, Chi-square=21), till 2006-07 and then gradually decreased to 116, 115 and 114 codes/100 consultations in the subsequent years . Usage of codes was highest for asthma among other disease areas (86% of total usage), of which use of less detailed codes beginning with H33 was 12%. The less detailed "H33.." code was used 5% times and the more detailed child codes were used 56% of times.

Discussion

We have found that there are hundreds of Read codes available to record allergic problems, but that these are poorly conceptualised, so that, for example, some codes which appear under a parent allergy code are unlikely to have an IgE-mediated basis and/or represent conditions which are managed by an allergist. We also found that there is a mismatch between the availability and usage of codes by GPs – in particular, 10% (n=36) of codes were used 95% times and 21% (n=73) were never used.

Study strengths and limitations

This study builds on over a decade of working with Read codes and our previous work on SNOMED-CT.(15) It is the first national investigation of primary care use of Read codes for allergic disorders. It is also based on a thorough analysis of the usage of Read codes for coding common allergic conditions using the GP records of over three million consultations over a seven year period.

However, a key limitation is that the findings are based only on Read allergy codes from participating PCCIU-R GP practices in Scotland. While Read codes are used universally in UK primary care and in some other settings, this dataset might not reflect coding trends in other parts of UK or for non-allergic diseases. While the dataset bridges the introduction of QOF, the data may not reflect any recent improvement in coding behaviour and pre-QOF data were available for only one year. Thus, adequate comparison could not be made for pre-and post-QOF, since GPs may have already increased their usage of QOF codes in anticipation of the following year. Also, no attempt was made in this study to extract information from free-text, since it was based only on usage of Read codes. However, we do not believe that this is a significant limitation, since a systematic review found that morbidity coding in consultations is 66-99% complete..(16) Furthermore, a large study on over 2 million patients with allergies found that almost 94% of allergen information was recorded using coded data.(17)

Interpretation in the light of the literature

Our finding that GPs had frequently coded the reason for consultation (eight QOF asthma codes (Table 1) used 50% times) is a similar finding to coding in depression.(18) In contrast to the findings of a study on coding diabetes in primary care,(19) we showed that use of less detailed asthma codes was low.

Implications for policy, practice and research

Understanding triggers, avoiding allergens and treating symptoms are key to managing allergic conditions.(6, 20) The National Allergy Strategy Group advocates that there needs to be greater awareness and understanding of allergy in primary care to allow more patients to be managed and to improve outcomes in this setting.(8) Better information through improved coding can lead to more appropriate diagnostic testing and avoidance of allergens so that patients benefit from new advances in, for example,

immunotherapy and biologic agents.(7, 21) The advent of this personalized medicine approach requires careful documentation of specific details about the patient's disease experience and test results. However, we have shown that in practice in Scotland, only 10% of the 352 available codes were used 95% of the times (Table 1). Thus, a list of the 10% most frequently used codes will be adequate for coding most allergic diseases in primary care. In fact 80% of code usage was for 3% of the codes, which is much more extreme than Pareto's 80-20 rule.(22) There were 73 codes which were never used, of which 42 were low-level codes.

Our analysis has shown that the currently available Read allergy codes can be divided into those that are highly-used, moderately-used and never-used. While it would be unwise to abandon the "never-used" codes, since rare cases do occur, it might be prudent to not spend much time on transferring these codes to SNOMED-CT. It certainly would be useful for accurate coding if the highly used/non-specific codes are available with more details in SNOMED-CT. It is important for allergy specialists to identify the most useful codes in primary care and highlight these, so that selection of codes during a busy consultation is made easy and the list of allergy codes remains manageable and better utilized. This finding echoes the survey response from 52% of 612 members in 144 countries who were in favour of having up to 30 diagnostic categories and 36% for up to 100 categories in a classification system for allergic diseases.(2)

Appropriate usage of codes for recording allergic diseases will prevent misclassification of patients and inaccuracies, thereby leading to better data quality for research. Research is needed to understand why some codes were never or rarely used. It is not known whether the code descriptions were difficult to access by busy GPs, perhaps from a long drop down list (e.g. 'allergy to strawberries') or whether perhaps GPs prefer to record such encounters using free-text,(23) as reported in a recent study.(24) This may also reflect the fact that, while asthma patients are mainly managed in primary care in the UK, patients with some other allergies (for example, food allergy and anaphylaxis) are more likely to be referred to hospitals for ongoing care. Hence terms for the former are more likely to be recorded in GP records.

Some of these codes (e.g. 'RAST tests', 'mushroom workers lung') may not be needed and can be made obsolete. Coding during clinical consultation has been identified as a barrier by European GPs.(25) Unfamiliarity with the available codes could also be an issue, so that much of the

consultation is not coded, but is recorded in free-text or narrative. Also sometimes GPs find free-texts and narratives more useful than numeric or alpha-numeric codes, as writing in their own words may help GPs to better understand their notes and hence patients.(26) Browsing for allergy codes in a GP software system can be made easier by listing the 36 most frequently used allergy codes we identified, with the other codes listed under 'other'. To encourage structured data entry and reduce free texts, more efficient interfaces which make codes easily searchable during busy consultations could be implemented.(17) The remaining codes can be arranged in a logical structure, for example by disease area, type of code or causal allergen and then alphabetically. When lower-level codes are available, but a GP chooses a high-level or middle-level code, it would be useful if the software offers an option for all low-level codes, prompting "Did you mean..." and "maximum number of middle-level and low-level codes are *X*", as opposed to how they are laid out currently (Figure 1). It would also be useful to offer GPs an appropriate choice of allergens when they code an allergic disease, by prompting "due to…" and "maximum number of allergens that can be offered are *Y*". This can be achieved using post-coordination in SNOMED-CT,(27) which has been found to be better suited as a terminology to describe an allergic reaction.(28) While a more detailed terminology is an essential pre-requisite to improving allergy coding, it is unlikely to be sufficient. This is because coding is a complex behaviour that is influenced, amongst other things, by personal preference, local context and incentives. In addition to the welcome detail in SNOMED-CT's structure and its user friendly browser, there needs to be training, incentives and feedback to clinicians to promote more accurate coding. An area of further research could be how post-coordination helps, to characterise patients with allergies. Another possible way forward is for greater use of coding clerks as occurs in UK hospitals and is being considered in US primary care practices.(29)

Current research suggests that asthma is an umbrella term for many diseases;(30) there is furthermore the opportunity for more detailed phenotypic characterisation of other allergic diseases.(20) Some progress has been made to address these issues by using cross-linking terms in ICD-11,(31, 32) and post-coordination in SNOMED-CT,(28) which have the potential to improve the phenotypic characterisation of asthma, allergies and hyper-sensitivities.

Conclusions

We believe that our findings show that simply moving to the more comprehensive multi-axial SNOMED-CT coding system is unlikely to improve the GP coding of allergy if the current coding behaviour of GPs persist. Rather, improving the range and depth of codes used by clinicians to achieve the envisaged "rich phenotype" will require several additional activities. Given the very substantial investments being made in exploiting routine data for research in the UK through the Farr Institute, MRC Medical Bioinformatics Centres etc. and elsewhere, there is a need to take active steps to ensure that patient data are of high quality, which includes the level of detail.(33) The imminent move to SNOMED-CT represents an important opportunity to work with the relevant health informatics and clinical communities to move this work forward. Our detailed analysis of allergy codes and their usage provides an evidence base to guide the future development and adoption of SNOMED-CT, with the allergy profession leading the way.

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Contributions

Mome Mukherjee conceived the study and acquired, analysed and interpreted data. Mome Mukherjee, Jeremy Wyatt and Aziz Sheikh categorised the codes. Jeremy Wyatt provided substantial contributions to data analysis, interpretation and presentation. Mome Mukherjee drafted the first draft. Mome Mukherjee, Jeremy Wyatt, Aziz Sheikh revised the drafts. Mome Mukherjee, Jeremy Wyatt, Colin Simpson, Aziz Sheikh all approved the final version of the manuscript.

Conflicts of interest:

All authors declare that they have no conflicts of interest.

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Table 1: List of the most frequently used 36 (10%) of the 352 Read allergy codes in primary care in Scotland during 2003-04 to 2009-10, by percentage usage out of total of 2,311,843 usages, and annual rate of use of the code per consultation, sorted by usage rate of the code

Greyed cells are the codes used for the Quality Outcomes Framework

Disease Area	Read code description	Read code	Percentage use of this code out of total usage of	Use of this code per consultation seen for this code
Asthma	Inhaler technique - good	663H.	22.0%	1.1
Asthma	Asthma not disturbing sleep	663O.	16.1%	1.1
Asthma	Asthma not limiting activities	663Q.	15.5%	1.1
Asthma	Asthma	H33..	4.7%	1.4
Asthma	Asthma limiting activities	663P.	4.1%	1.1
Asthma	Asthma disturbing sleep	663N.	3.6%	1.1
Asthma	Asthma monitoring	663..	3.6%	1.4
Asthma	Asthma NOS	H33zz	3.2%	1.2
Asthma	Inhaler technique observed	6637.	2.4%	1.2
Asthma	Asthma management plan given	663U.	1.9%	1.1
Asthma	Asthma unspecified	H33z.	1.6%	1.4
Asthma	Spacer device in use	663I.	1.5%	1.1
Asthma	Asthma treatment compliance satisfactory	663n.	1.0%	1.1
Asthma	Acute exacerbation of asthma	H333.	0.9%	1.3
Asthma	Inhaler technique shown	6636.	0.5%	1.1
Asthma	Asthma trigger	178..	0.5%	1.0
Asthma	Bronchodilators used more than once daily	663L.	0.3%	1.1
Asthma	Resp. treatment changed	663B.	0.3%	1.1
Asthma	Follow-up resp. assessment	6632.	0.2%	1.2
Asthma	Bronchodilators used a maximum of once daily	663M.	0.2%	1.1
Asthma	Asthma treatment compliance unsatisfactory	663p.	0.2%	1.0
Conjunctivitis	Other chronic allergic conjunctivitis	F4C14	0.2%	1.1
Drug allergy	Drug hypersensitivity NOS	SN52.	1.1%	1.2
Drug allergy	[V]Personal history of drug allergy	ZV14.	0.9%	1.2
Drug allergy	[V]Personal history of penicillin allergy	ZV140	0.7%	1.0
Drug allergy	H/O: drug allergy	14L..	0.7%	1.2
Drug allergy	H/O: penicillin allergy	14L1.	0.4%	1.0
Eczema	Eczema NOS	M12z1	2.6%	1.2
Eczema	Atopic dermatitis/eczema	M111.	0.7%	1.1
Eczema	Dermatitis NOS	M12z0	0.6%	1.2
Other	Allergy	SN53.	0.4%	1.1
Rhinitis	Allergic rhinitis due to unspecified allergen	H172.	0.9%	1.1
Rhinitis	Allergic rhinitis	H17..	0.6%	1.1
Rhinitis	Allergic rhinitis due to pollens	H170.	0.4%	1.0
Rhinitis	Allergic rhinitis due to other allergens	H171.	0.3%	1.2
Urticaria	Urticaria	M28..	0.6%	1.2

Source: Primary Care Clinical Informatics Unit Research (PCCIU-R), Scotland

Table 2: List of the 73 Read allergy codes which were never used in primary care in Scotland during 2003-04 to 2009-10, sorted by disease area

Disease Area	Read code description	Read code
Anaphylaxis	Anaphylactoid glomerulonephritis	K0323
Anaphylaxis	Anaphylactoid reaction due to haemodialysis	SP0G.
Anaphylaxis	Anaphylactic shock due to serum	SP34.
Angioedema	Acquired C1 esterase inhibitor deficiency	SN510
Angioedema	Hereditary C1 esterase inhibitor deficiency	SN511
Asthma	Asthma trigger - pollen	1781.
Asthma	Asthma trigger - tobacco smoke	1782.
Asthma	Asthma trigger - warm air	1783.
Asthma	Asthma trigger - emotion	1784.
Asthma	Asthma trigger - damp	1785.
Asthma	Asthma trigger - animals	1786.
Asthma	Asthma trigger - seasonal	1787.
Asthma	Asthma trigger - cold air	1788.
Asthma	Asthma trigger - respiratory infection	1789.
Asthma	Asthma trigger - airborne dust	178A.
Asthma	Asthma trigger - exercise	178B.
Asthma	Asthma severely restricts exercise	6630.
Asthma	Respiratory disease treatment started	663C.
Asthma	Respiratory disease stopped	663D.
Asthma	Using inhaled steroids - low dose	663g4
Asthma	Non-invasive ventilation therapy review	663i.
Asthma	Declined to perform inhaler technique	663o.
Asthma	Asthma limits activities 1 to 2 times per month	663P0
Asthma	Asthma limits activities 1 to 2 times per week	663P1
Asthma	Asthma limits activities most days	663P2
Asthma	Bronchodilator used infrequently	663Z0
Asthma	Bronchodilator not used in last month	663Z1
Asthma	Chronic asthma with fixed airflow obstruction	H335.
Asthma	Sequoiosis (red-cedar asthma)	H35y6
Drug allergy	H/O: selective oestrogen receptor modulator allergy	14LV.
Eczema	Asteatotic eczema	M11A.
Food allergy	Mushroom allergy	SN588
Food allergy	Allergy to strawberries	SN589
Food allergy	Allergy to soya	SN58A
Other	Casoni skin test	3358.
Other	Allergy test - not skin	336%
Other	Further RAST tests	43l%
Other	RAST test	43Q%
Other	Supplementary RAST tests	43t%
Other	Other RAST test	43Y%
Other	Allergic disease follow-up assessment	66G2.
Other	Closed special patch testing of skin	7P153
Other	Patch testing of skin with patient's own products	7P155
Other	Other specified diagnostic application tests on skin	7P15y
Other	Diagnostic application tests on skin NOS	7P15z
Other	Allergy diagnostic series 1 skin prick testing kit	c951.
Other	Allergy diagnostic series 2 skin prick testing kit	c952.
Other	Bagassosis	H351.
Other	Bird-fancier's lung NOS	H352z
Other	Suberosis (cork-handlers' lung)	H353.
Other	Malt workers' lung	H354.
Other	Mushroom workers' lung	H355.
Other	Maple bark strippers' lung	H356.
Other	Fish-meal workers' lung	H35y2
Other	Furriers' lung	H35y3

Disease Area	Read code description	Read code
Other	Grain-handlers' disease	H35y4
Other	Pituitary snuff-takers' disease	H35y5
Other	Air-conditioner and humidifier lung	H35y8
Other	Allergic parotitis	J0720
Other	Allergic enterocolitis	J4322
Other	Allergic gastroenteritis NOS	J432z
Other	Allergic arthritis of unspecified site	N0620
Other	Allergic arthritis of the upper arm	N0622
Other	Allergic arthritis of the forearm	N0623
Other	Allergic arthritis of the pelvic region and thigh	N0625
Other	Allergic arthritis of the lower leg	N0626
Other	Allergic arthritis of other specified site	N0628
Rhinitis	Other seasonal allergic rhinitis	Hyu20
Rhinitis	Other allergic rhinitis	Hyu21
Urticaria	Vibratory urticaria	M284.
Urticaria	Urticaria geographica	M28y0
Urticaria	Menstrual urticaria	M28y1
Urticaria	Urticaria persistans	M28y2

Source: Primary Care Clinical Informatics Unit Research (PCCIU-R), Scotland

Figure 1 Screen shots from primary care practice in Scotland of available allergy terms and codes when searched by keyword

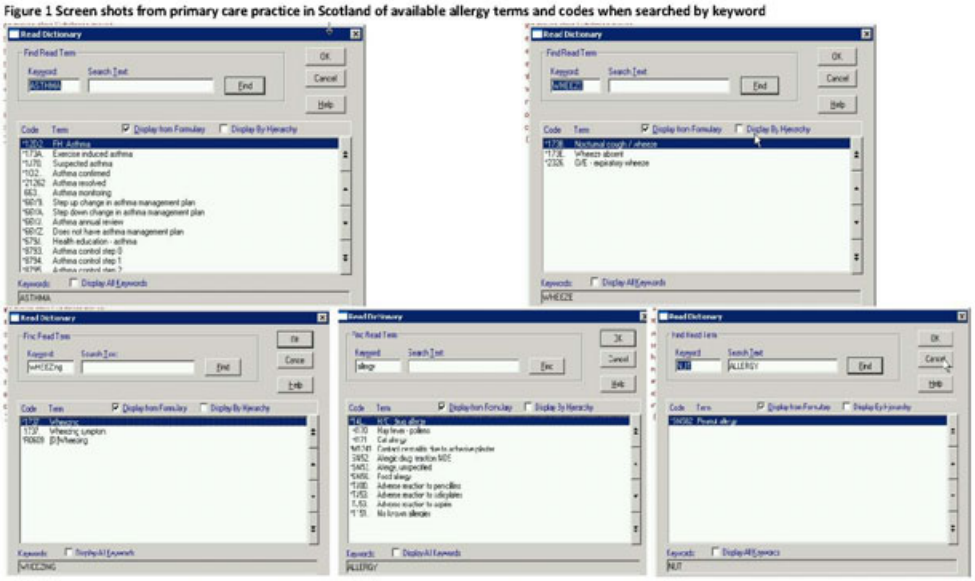
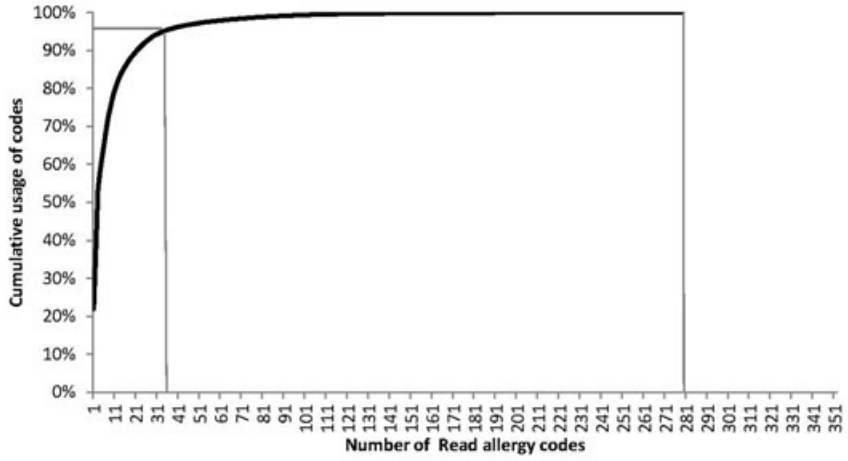
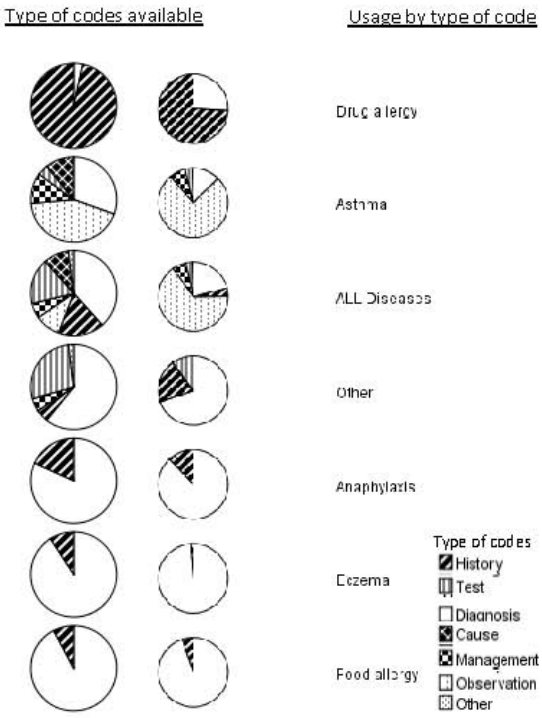


Figure 2: Cumulative usage of 352 Read allergy codes over 2,311,843 consultations recorded in primary care in Scotland during 2003-04 to 2009-10



Source: Primary Care Clinical Informatics Unit Research (PCCIU-R), Scotland

Figure 3: Percentage distributions of the type of Read allergy codes and their usage in primary care in Scotland during 2003-04 to 2009-10 by disease areas, *arranged by value*



Source: Primary Care Clinical Informatics Unit Research (PCCIU-R), Scotland