

Reporting of drug allergies for use in a national decision support system

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Abstract. In Denmark, there are plans for establishing a national decision support system, providing on-line support for physicians during drug prescribing. This includes establishment of a national database containing information about each patient's drug allergies. Allergy information already exists in medication modules in hospital systems and primary care systems and thus constitutes a potential source for the national allergy database. This paper reports an analysis of local data structure, content and registration policies with the aim to re-use existing allergy data. The result of the analysis is that due to lack of harmonisation most existing cannot be re-used in the national database. The paper propose a common dataset for allergy data where national and international standards were considered.

Keywords. Drug allergy, national database, data structure, decision support

Introduction

In Denmark, there are plans for establishing a national decision support system, providing on-line support for physicians during drug prescribing^[1]. One of the decision support services provided is checking the drug against the patient's previously reported drug allergies. These drug allergy reports may arise from hospital care or primary care and originate from many different medication systems or EHR systems.

Denmark already has a shared medication record in place at a national level. Using this national service health care professionals can look up patients' complete and current medication information cross sectors. This service is integrated with the local medication systems. The new national decision support system will work seamlessly with the shared medication record. When the physician is in the process of prescribing a drug in a local system, the information will also be transmitted to the national decision support system – providing an instant advice about that prescription.

In order to provide reliable alerts towards previously reported drug allergies, the decision support system requires highly structured and standardised drug allergy reports. All hospital are already using medication systems and are obliged to register information about drug allergies. These data is unfortunately highly inconsistent, and the use of classifications varies. Furthermore, in primary care sector, the data is less structured than in the hospital sector.

The National eHealth Authority initiated an analysis in order to explore the possibility to re-use the existing local information on drug allergies for use in a national drug allergy database. This included suggestions for how the local information could be converted and securely uploaded to the national database. The analysis should also propose a standard dataset for the national drug allergy database. This paper reports the results of this analysis. However, The National Board of Health is responsible for making the final decision about which drug allergy data clinicians must register.

1. Methods

Since data on allergies already exists in the hospital systems and primary care systems, an in-depth analysis of the data structure and content was made – including the use of classifications.

Representatives from the five regional it-departments responsible for running the hospital systems were interviewed. The providers of the regional medication modules and EHR systems were also consulted. Material included database descriptions on the field level, screen dumps, and user guidelines. In addition, 250.000 free text allergy records from a region were analysed.

The seven largest system providers of primary care systems all responded to a questionnaire regarding data structure for allergies. Several responses were followed up by telephone interviews.

When using a national drug allergy database physicians have to rely on data reported by health care professionals from other institutions and regions. To establish a trustworthy information basis, it is necessary to ensure a common understanding of what is reported, and that the policies and procedures for data collection are transparent. Therefore, the regional guidelines from the five Danish regions regarding allergies were analysed.

In order to understand to what degree the existing data could be re-used for decision support, requirements from the decision support system were analysed. The aim was to identify the minimum of structured data needed for the system to work reliably.

Even the analyses should point out a pragmatic solution, an attempt was made to match the data structure in the local systems with national and international standards. Several standards were consulted, including HL7^[2], openEHR^[3], CEN^[4], the national standard for the shared medication record^[5], and the national standard for data exchange between primary care records^[6].

2. Results

2.1. Analyses of regional guidelines

In the Nordic countries the term “CAVE” (= be aware) is used for alert information in broad terms, and allergy is considered a part of this concept. At the national level, the Danish Healthcare Quality Programme (DHQP) mentions “allergy and intolerance” and gives a general description of these. There is no detailed national guideline defining alert information nor a specification of what allergy data to register.

The regional guidelines describe alert information the same way as in DHQP, however it is recognised that allergy and intolerance cannot be distinguished clinically. The regional guidelines describe the *requirements* for allergy registration quite homogenously – i.e. in what situations data should be collected and what the responsibilities for the different professional groups are. In general, the guidelines state that allergy information should be registered at every admission and typically, a physician is responsible for the data quality. All regions requires information on both drug allergies and allergies due to other substances.

2.2. Analyses of existing data

When it comes to the actual data registered, there is large variation in the data content and data structure – including the use of classifications. The following information was included in the data analysis:

- Identification of the drug or substance resulting in the allergy
- Drug allergy reactions
- The certainty that the drug was the reason for the reaction
- Severity
- Other allergies
- Other allergy reactions
- Dates for start, updates and termination of the allergy
- The role of health care professional deciding to report the allergy

The drug or substance resulting in the allergy were identified using ATC codes^[7] in three regions and the more specific “Drug ID” in two regions. In four regions structured entries was required. In the 5th region free text was also allowed. Regarding the allergy reactions, three regions used free text, and two regions required use of a classification. One of the regions used a restricted classification with 11 possible entries for allergy reactions; in the other region all diagnose codes were allowed. Two regions provided classifications for certainty, and one region provided a classification for severity.

2.3. Proposal for a new dataset

Based on the input from the regional guidelines, the analyses of the existing data in the systems, taking into account requirements from the decision support system and considering the national and international standards and terminologies, the following minimum dataset and extended dataset for the national allergy database is proposed.

Proposed datasets	
Minimum dataset	Extended dataset
1. Drug identification	9. Severity
2. Drug allergy reaction type	10. Certainty
3. Health professional making the decision	11. Valid from date
4. Entered date	12. Information source
5. Updated date	13. Allergy verification method
6. Terminated date	14. Other allergy identification
7. Source system	15. Other allergy reaction type
8. (Link to) descriptions of registration policies and routines	

Figure 1. Proposed minimum dataset and extended dataset for the national allergy database

A description of the data items and the use of classification has been developed. Regarding the identification of the drug, an ATC code or a Drug ID is required. While the Drug ID is pointing to a unique drug, the ATC code may cover similar drugs, with different active ingredients. However, accurate information about the active ingredients is needed for the decision support system, and the National eHealth Authority is resolving this by developing a new drug terminology based on SNOMED CT. A classification of 11 entries is proposed for the allergy reaction. However, this shortlist must be supplemented with access to a complete diagnosis list.

It is important for the treating physician to know the source of the allergy information. Therefore, it is required to report the role of the health care professional who have taken the decision to report the allergy, including the organisational affiliation. This classification follows the one used in the shared medication record. In order to support the transparency towards the information sources, it is also required to provide information about the policies and procedures for data collection. The dataset also includes dates for entry, update and possible termination of the allergy (figure 1).

The minimum dataset is selected based upon what is needed to make the decision support system work in combination with the clinician's minimum requirements for understanding and trusting the information. The minimum dataset also takes into account which data actually are currently registered. However, when establishing such a national database, it should also be planned for improving the data quality compared with the existing situation. In the extended dataset, other information considered useful by the clinicians is included. Examples are severity and certainty, and a possibility to enter information about other allergies than drug allergy.

Comparing the proposed dataset with the data in the existing systems, the conclusion is that the drug identification is the only re-usable data item. Even this is cannot be used for all patients, since structured entry is not mandatory in one region. Data from primary care can be used for indicating penicillin allergies at a general level, but these data are not reported for all patients. For the remaining data, changes are needed in the local systems along with changes in the regional guidelines.

3. Discussion

The situation described in this paper regarding allergy data, illustrates a common challenge when trying to standardise datasets at a national level. The situation is of course more complex when many systems are already in use and considerable data already exists.

The aim of this analysis was to assess the possibility for re-using existing data. If data can be re-used, data entry work can be saved. On the other hand, if the data quality is so low that it threatens patient safety, new data must be generated. To improve quality of care, reliable, computable data is needed. In many cases, this implies more structured data entry by clinicians. Even data entry methods improve, it is important to restrict the requirements and only include the data clinicians consider useful.

For example, severity and certainty information was placed in the extended dataset (figure 1). These data items are not required for the decision support algorithm, and even some clinicians find them useful, there are indications of low use if this type of information. 250.000 free text allergy records from a region were analysed. Approximately 1% contained terms related to certainty, and only 0,2 could be related to severity. The most frequent term was "penicillin", mentioned 20% of the entries.

One of the challenges trying to standardise data cross sectors and professional groups, is that common definitions is often lacking. Even differences can be worked out in daily practice, strict concept delimitation and use of common terminology is necessary to re-use data in a secure way. SNOMED CT provides a great help in this area. However, the terminology is very extensive, and subset definitions are required for practical implementation.

The case reported in this paper shows that concept discussions are needed in Denmark. As mentioned, there is not a clear consensus regarding the alert information concept and how drug allergy and allergy subtypes is related to the broad concept.

Inspiration may come from the Swedish organisation *Sjukvårdsrådgivningen*, which made an analysis in the field of allergy information^[8]. This work has given substantial input to CEN/ISO standards regarding alert information. The analysis reported in this paper used a modification of the dimensions described in the Swedish report (Figure 2). Drug allergies and other allergies are specified separately, and subtypes are included based on the openEHR adverse reaction archetype³. This structure seems to capture the “CAVE” concept used in Denmark, and at the same time clarifies the areas regarding allergies, where data collection is mandatory. It also shows the allergy subtypes, which clinicians find important.

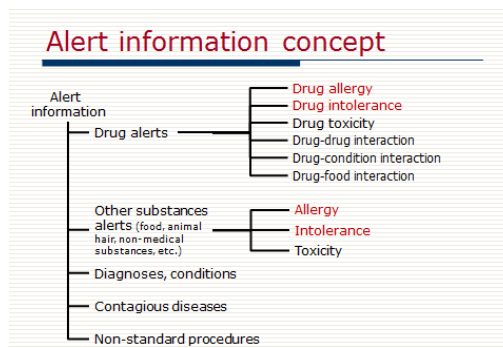


Figure 2. Overview over alert information. Drug allergy/intolerance is considered a part of this

In addition to the clarification of the concepts, a national guideline regarding data reporting for allergies and an agreement on the dataset is needed. This can be followed by an implementation process in the regions and in primary care systems using the already established infrastructure for the national shared medical record.

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