Challenges of Comparing Medication eHealth Services in the Nordic Countries

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Abstract— **A prescription and medication service that is optimised to protect against unnecessary harm is an essential component of a safer healthcare system. To this means, the Nordic countries have put considerable efforts in digitizing their prescription and dispensing processes and making medication eHealth services available for clinicians, pharmacists and patients. As these e-services are being established and applied, there is a need to monitor and learn from their use. This paper reports from a sub-study of a larger activity on developing indicators for monitoring eHealth services in the Nordic countries. We describe different medication eHealth services and compare their availabiliy to professionals and patients in the Nordic countries. We found that an ePrescription service is available for clinicians and patients in all Nordic countries, but services that enable renewal or viewing of prescriptions by patients are not commonly available yet. A major challenge when comparing medication eHealth services is the fact that definitions of indicators vary between countries.**

Keywords- *Medication data, ePrescription, medication list, indicator*

I. INTRODUCTION

Access to information about medication is crucial for high quality healthcare and patient safety [1]. Viewing an up-to-date list of current medications is a prerequisite when prescribing a new drug, administering medications or assessing potential side effects, decreasing errors when dispensing medications, for preventing medication errors and adverse drug events in the healthcare system [2], as well as for control of financial aspects for prescription products. From the patient's perspective, having an updated list of their medications is an effective means of ensuring that the health professionals they encounter on their path through the health system are kept aware of some of the most important aspects of their health.

Most nations now devote large resources in digitizing their healthcare systems and in building eHealth services for care professionals and patients. As such services have been built and taken into use, there is a need for monitoring and assessing the use of such services for mutual learning and improvement [3]. What characterizes eHealth services that are available at a national level in the Nordic countries and how are these being used? These are some of the questions that a Nordic eHealth Research Network (NeRN) has posed in an inter-Nordic collaboration on developing indicators for monitoring eHealth. NeRN is a research group [4] reporting to the eHealth group of the Nordic Council of Ministers, and is working with development, testing and assessment of a common set of indicators for monitoring eHealth in the Nordic countries (Finland, Sweden, Norway, Iceland and Denmark), plus Greenland, the Faroe Islands and Åland.

Medication eHealth services include different e-services related to medication management for patients, pharmacists and care professionals. A central element of medication eHealth services is the electronic recording of prescriptions. The representations of prescriptions can be described as involving three different characteristics: Prescription as assigning a *right,* Prescription as a *withdrawal action* (Dispensing) and Prescription as an *administered action*, i.e., the patient has taken the medicine. As such*,* the *decision to medicate, prescribing*, *dispensing* and *administering medicine,* are different aspects of a Medication eHealth service in form of an ePrescription service, see Figure 1. The decision to medicate is the first step, where the health professional decides when and how the patient should be medicated. ePrescribing is the electronic prescribing of medicine by a health professional to a patient and making it available to a pharmacy, where the medicine can be dispensed and picked up by the patient. The prescription is a signed artifact (document) that describes the medication and how it shall be taken. It gives the patient the right to pick up the medication at the pharmacy and use it according to the description. In hospital settings, the health pofessional does not need to perform the actual prescription and can go directly from deciding to medicate to dispensing of the medicine, as shown in Figure 1. Dispensing is the retrieval

of a prescription and the dispensing of the medicine to the patient. The patient consequently administers the medication, when consuming it. The medication list is the overview of the medications that are prescribed and dispensed to the patient. An eMedication list service allows for both patients and professionals to access it.

Figure 1 illustrates worktasks related to medication, and the storage of data related to each task. The decision of medication is noted in a Medication Management System (MMS) by the health professional. Outside hospitals a prescription can be issued on a sheet of paper, telephoned to a pharmacy or sent as an electronic order to a prescription server, where it can be accessed by pharmacies. When a drug is dispensed at a hospital is will be documented in the MMS, if it is dispensed at a pharmacy,it will be documented in a pharmacy system – in some countries at a national level. Health professionals store information about the administration of drugs in a MMS.
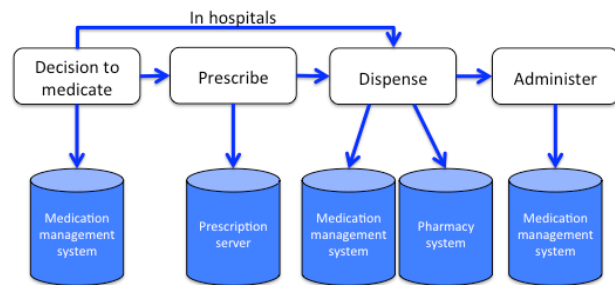

Figure 1. Overview of the process of a prescription from decision to medicate to administration of the medicine and where the data is stored in a medication eHealth service.

This paper addresses the issue of availability of *eHealth services related to medication* and offers a comparison of the availability for patients and healthcare professionals in the Nordic countries. The following research question guides the work presented in this paper:

What is the availability of ePrescription and eMedication list services in the Nordic countries?

The research question encompasses information from indicators identified by NeRN and is divided into following sub-questions for cross country comparison:

- Is an ePrescription service available?

- Does a national electronic medication list comprise prescribed and dispensed medication available?

- Is it possible for patients to renew their prescriptions electronically?

- Is it possible for patients to view their ePrescriptions?

Section II describes the methods used in the project. Section III offers a presentation of the results, and Section

IV includes the discussion. Section V comprises concluding remarks.

II. METHODS

The indicators used in this study were derived from a rating survey performed in 2013, constructed on the basis of national survey questionnaires in the Nordic countries, an OECD model survey developed in 2012, eHealth policy analysis performed in 2013 and variables presented in the eHealth evaluation literature [5].

Data about the indicators for ePrescription and eMedication list services arise from discussions in a series of workshops with participants from all the Nordic countries arranged by the NeRN and a summary of the national survey questionnaires in the Nordic countries performed from 2010-2014 [6]. The results are presented as proportion of public healthcare organisations having the functionality within each of the Nordic countries.

III. RESULTS

When presenting the results, the sub-questions are addressed separately.

A. Availability of a national ePrescription service

The indicator is identical to an OECD indicator, but measured at a national level.
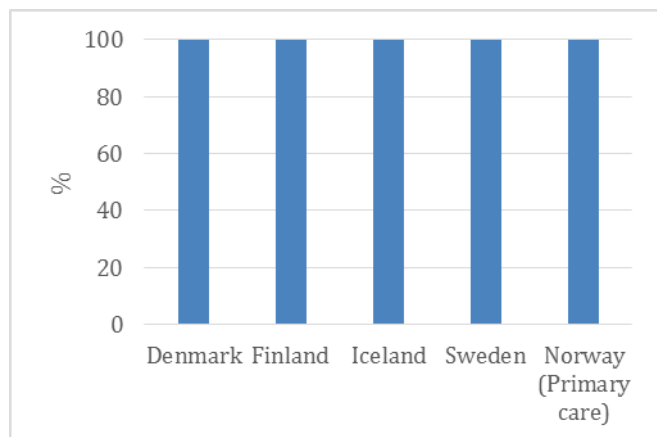

Figure 2. Availability of an ePrescription service.

Figure 2 shows that by the end of May, 2014, all the Nordic countries have a national ePrescription service in place. In Finland, Denmark, Iceland and Sweden, ePrescription is available at a national level, i.e., at all public hospitals within the country, for all GP´s, and at every pharmacy in the country. In Finland, the roll-out of ePresciption to the private sector is currently on its way. In Norway, all pharmacies, general practitioners, private specialists and emergency doctors, all (non-hospital) doctors

allowed to prescribe drugs have access to ePrescription, and soon also dentists.

B. Availability of a national electronic medication list of prescribed and dispensed medication

The indicator, which is identical to the OECD indicator, measures the availability of information about medication that has been previously prescribed, or dispensed at another institution. However, the contents of this indicator vary in the Nordic countries. A national list of prescribed and dispensed medication is not necessarily the same as the patient´s current medication list, since for example the medication dispensed while admitted to a hospital or purchased without a prescription may not be included.
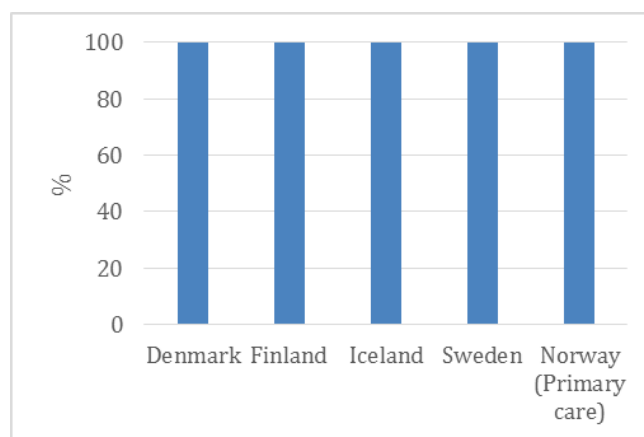

Figure 3. Availability of national electronic medication list.

Figure 3 shows the availability of national electronic medication lists in the Nordic countries. In Denmark, the medication list has been 100% available since 2010, including all types of prescriptions made outside hospitals as well as all medications dispensed both in and outside the hospital.

In Finland, the national prescription database shows prescribed and dispensed medication, but not those administered during hospital stay. Patients can preclude health professionals from accessing the data. The national list of prescriptions does not include prescriptions on paper or prescriptions that have been made by phone, nor prescriptions related to social care. From 2015, the national KANTA‑system will generate a comprehensive list of current medication for the patient from the prescription database and data from individual electronic patient record (EPR) systems, including medication administered during hospital stay.

In Iceland, the availability of the national list of prescribed and dispensed medicine is 100%, since 2014, and includes all ePrescriptions, both prescribed and dispensed, as well as some paper and telephone prescriptions. All paper

and telephone prescriptions will be available in 2015. As in Finland, the medication list does not include the medication administered during hospital stay.

In Norway, a national medication list is to be found in the "Kjernejournal" (Summary care record), and it may also be accessed via the national portal "helsenorge.no". "Kjernejournal" is running as (in 2014) a pilot implementation in two regions. "Kjernejournal" will contain a list of the medicines the patient has been prescribed (both ePrescriptions and paper prescriptions) in Norwegian pharmacies. Medicines the patient purchased without a prescription, received at an emergency department, hospital / nursing home or purchased abroad will not appear. Prescriptions that have been dispensed are stored in the "Kjernejournal" for three years.

In Sweden, the list of medications that have been dispensed to the patient has been available since 2012. The patient decides if the doctor is allowed to see the information in the database. A consent is needed from the patient. Very few patients i.e., 3‑4.000 patients out of 9 million actually choose to hide their information,

C. Availability of electronic medication renewal

This indicator shows the availability of services that enable electronic medication renewal at the national level. The indicator is identical to the OECD indicator.
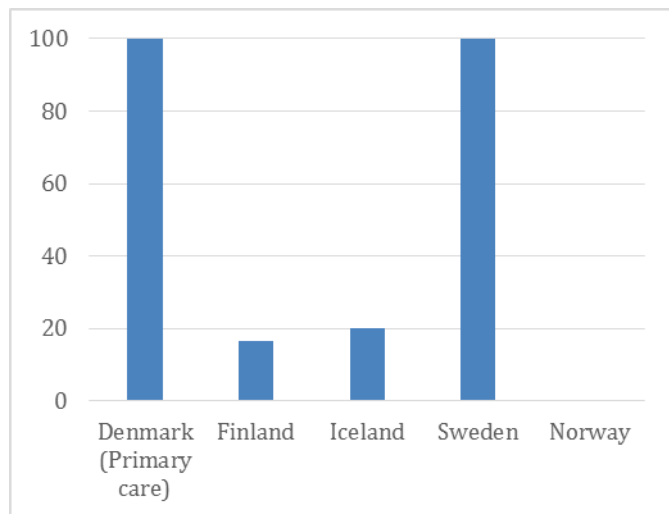

Figure 4. Availability of electronic medication renewal.

Figure 4 shows the availability of electronic medication renewal services in the Nordic countries. In Denmark, there is 100% availability of electronic medication renewal in primary care at a national level.

In Finland, this is currently an organizational activity. The patient needs to contact the pharmacy or primary health care centre to ask for a renewal, although many

organizations provide an electronic web portal to mediate the request.

In Iceland, only a few health care institutions offered this service in 2014. However, this is currently being implemented and is expected to be at a national level before end of 2015.

In Norway, this service has not been established at the national level. General practitioners can offer service functionalities for patients depending on what portal provider they have chosen.

In Sweden, electronic medication renewal has been available since 2012 in the national service "My healthcare contacts (MVK)". MVK is a citizen web portal that enables secure communication between patient/ consumer/ customer and healthcare and longterm care. The patient can book and rebook appointments, renew prescriptions, order a copy of his patient record and in some county councils also access it.

D. Availability of electronic viewing of patient's own prescriptions

This indicator concerns electronic services that enable patients to view their own medication data. We present data for services at a national level. The indicator is identical to the OECD indicator.
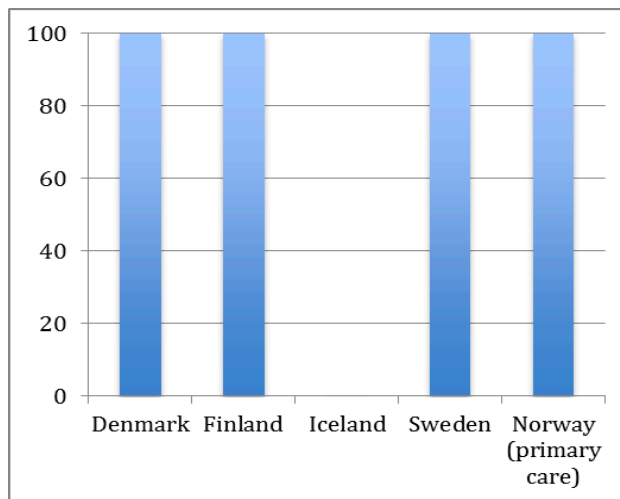

Figure 5. Availability of patients' viewing electronically of own medication data

Figure 5 shows the availability of patients` viewing electronically of own medication data. In Denmark, patients have had the opportunity to view their own medication data covering the past two years since 2009. In the beginning, it only enabled viewing of prescriptions made outside hospitals. Since 2013, viewings of prescriptions made by hospital physicians have been included.

In Finland, all patients now have access to all prescriptions.

This service did not exist in Iceland until November 2014. Currently, it only includes ePrescribed medications. However, plans are already underway to enhance these services to include also paper- and telephone prescribed medication.

Norway established this service in 2012-2013 via "My prescriptions" in helsenorge.no, but the service currently only enables viewing of the most recent prescriptions made by GPs.

In Sweden this service has been available since 2012 as a national service through "My healthcare contacts" (MVK).

Availability for patients viewing of medication data that (public/private sector) professionals have prescribed is a feature of national health information systems in the Nordic countries.

IV. DISCUSSION

The Nordic countries seem relatively homogeneous and comparable in terms of political system, infrastructure, culture, and educational, social- and healthcare systems; however providing comparable indicators from surveys across the Nordic countries involves a number of challenges. The samples of the survey varied: in Denmark, a representative sample of clinical end users participated whereas in the other countries leaders in health care institutions were approached. The survey questions were formulated in the language of the respective countries, and the time and frequency of the surveys varied. Detailed discussions of these differences settled most of the variance they introduced, and the results obtained on the medication issues were quite comparable.

Comparable e-services are the ePrescription services and the list of prescribed medicines, i.e., the proportion of public and/or private organizations where prescribed medicine outside the own organization, are available in all the Nordic countries. Although ePrescription is available it is still possible to issue prescriptions on paper or by telephoning the pharmacy. This proportion has not been measured but it is assumed that it is neglectable given the high number of prescriptions made electronically.

The ePrescription services are well established and mature in some countries, while in other countries they are still in a pilot phase. The availability of a National list of prescribed and dispensed medication has also by 2014 reached a level of saturation. In Denmark, this service has been available for some years. Although the service is available in all countries the architecture of the systems behind the services differ significantly, but a detailed analysis of these differences has not been targeted in this study. A special feature for patients to hide specific medications is available in all countries for similar ethical reasons.

The availability of an e-service to renew medication is not available in all countries. In Denmark, and Sweden, the service has been available for some years, however it is implemented in different ways. In Denmark, this service was implemented for all patients to use as part of the agreement between the general practitioners and the regions who pay them fee for service. In Sweden, the service is available to all citizens through a national portal. In other countries this service is available only through dedicated organizations.

The service that enables patients to view their own prescriptions has been implemented in all countries.

However, when going into detail about the content of the indicators, the NeRN group realized that characteristics of the indicators varied between the respective countries.

The availability of a national ePrescription service was saturated, but the content measured was different between the Nordic countries. In the definitions of the indicators, the fact whether the medication was prescribed, dispensed or administered was not clearly specified, or the data was not available because the question was not asked specifically in the surveys. It became apparent that the content of ePrescriptions and the measurements of them varied between the countries making detailed explanation in the presentation of the results necessary for each indicator and each country.

Another point which makes comparison difficult is the fact that ePrescription does not cover paper-based prescriptions per se, which are regulated in another way than electronic prescriptions. It has different consequences in the respective countries. In Denmark, for instance the paper-based prescriptions will be synchronized with the overview of the patient's own prescriptions once the medicine has been dispensed in a pharmacy. A related issue is that while ePrescriptions are 1-1 prescribed and dispensed medication, where the paper based prescription can hold more drugs on the same piece of paper.

The e-services in this paper more specifically referred to as *the medication eHealth service*, may have different scopes, i.e., intended coverage area. While some e-services are accessible at a national level, others are either limited geographically to a regional level, administratively to the hospitals or the organizations, or to specific roles, for example to healthcare professionals and not to patients. The focus in this study is the availability of medication eHealth services at a national level and availability at a more granular level was therefore not presented.

V. CONCLUSION

The study showed that the availability of patients' prescription information and ePrescriptions made available to any pharmacy is realized via the national ePrescription systems in each Nordic country. Moreover, the availability

of medication renewal requests as well as the availability of electronic viewing of patients' own prescriptions is comprehensive on national level in some countries (Sweden, Denmark and Iceland). Patients' access to view their prescription data electronically is also broad. However, the NeRN findings demonstrated that the services are realized differently in the respective countries and also definitions of indicators vary between countries hampering comparison.

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