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Incentives and Obstacles Towards Seamless Care Pathways in Different Countries

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Abstract. In a cross country comparison, we try to identify factors which may influence the degree of interaction between inpatient and ambulatory patient care. For three Scandinavian countries, the United states and Switzerland, the IT-systems in hospitals and healthcare regions as well as electronic health records are described and characterized and the results contrasted with the way healthcare is delivered and financed. As a result, the existence of a national patient identifier, a reduction in the number of hospital information systems and a common database for healthcare professionals in inpatient and outpatient care are identified as positive contributors towards seamless care pathways. In comparison, the existence of an Electronic Health Record in the hands of the patient, or the existence of a tax paid healthcare system or the amount of healthcare expenditure do not necessarily contribute to this effect, since they can be observed also in countries with intermediate or improvable linkage between inpatient and outpatient sector. Seamless patient care has no directly visible correlation to life expectancy or preventable mortality.

Keywords. Information Exchange in care settings, care pathways, digital health

1. Introduction

As healthcare costs are increasing worldwide due to more diagnostic options and an ageing population, many attempts are being made to contain healthcare costs. The DRG system has been introduced in many countries for inpatient care reimbursement, leading to shorter hospital stays and more procedures and activities done in outpatient treatment [1]. Hospital at home activities in various countries strive to improve patient outcomes by providing “hospital equivalent” care at home [2].

A good linkage and communication between outpatient care delivered by general practitioners (GP) or in medical centers and inpatient treatment in hospital is desirable to ensure successful clinical pathways and to avoid readmission to hospital [3]. This requires good (digital) communication and thus a high degree of digitization in healthcare [4]. But other incentives or obstacles may play an important role as well, e.g. healthcare financing and incentives for the healthcare providers.

This paper tries to shed some light on incentives and obstacles for seamless care in inpatient and outpatient treatment in different countries and compares the IT environments and the degree of digitization under the question

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Which factors influence interaction between outpatient and inpatient care and how are they connected to the respective healthcare system and its digitization?

2. Methods

This work relies on data collected in a six-month sabbatical between August 2023 and February 2024. The author visited four hospitals in the US (JHH Johns Hopkins Hospital Baltimore, VUMC Vanderbilt University Medical Center, NYP/CUIMC New York Presbyterian Hospital, UAB University of Alabama Hospital), one hospital in Denmark (AUH Aarhus University Hospital), one in Finland (TYKS University hospital in Turku) and one in Estland (Talinn East Hospital) for approximately 2 weeks each.

During his stay the author conducted a total of about 60 interviews with persons responsible for the IT infrastructure, for the nursing workforce of the hospital and ward nurses. This was accompanied by observational visits in the hospitals totaling 10 full nursing work shifts. Notes were taken for each semi-structured interview and to memorize events during the observation. All communication and interviews were done in English language.

Furthermore, sources such as web presentation of the hospitals, wiki pages, WHO and national statistiscs databases and, if available, OECD country reports were consulted. The Swiss observations come from 10 years work experience as a teacher for medical informatics and researcher working in projects with Swiss hospitals. Included are observations made in a study concerning six Swiss hospitals within the SNF founded project Digi-Care [5].

3. Results

3.1. Country characteristics and demographics

Let's start with a first demographic comparison and some information about healthcare financing in the countries included in this research. Data is derived from [6-11]:

Table 1. Country characteristics. Most data from 2019.

Country	Inhabitants	GDP	Healthcare financing	Healthcare expenditure
United States	333'287'557	75'180 US$	Mixed	10'687 US$
Denmark	5'932'654	68'295 US$	Tax paid	5'526 €
Finland	5'525'292	51'030 US$	Tax paid	3'150 €
Estland	1'328'976	28'136 US$	Insurance	1'733 €
Switzerland	8'962'258	101'510 US$	Insurance	10'559 €

It proved very difficult to obtain data on healthcare expenditure for Switzerland and the US where no OECD reports are available, these numbers must be considered with care.

United States: The country has 50 states with local legislation. Healthcare expenditure is high with many institutions among the first worldwide, but healthcare is not easily available or affordable for everyone. Typically, employees receive healthcare benefits and healthcare programs from their employer. This used to be non-mandatory,

whereas the affordable care act forced people to buy into a health insurance. For the Retired Medicare offers healthcare coverage. Persons who worked for some time in the army are entitled to treatment under veteran's administration. Medicaid offers limited healthcare to the poor. A general and increasing problem are additional out of the pocket payments, required also in Medicare.

Denmark: Healthcare is organized in five healthcare regions and completely tax paid. Thus, every region has the task to keep their citizens healthy and uses capitation based payment. The number of hospitals has been significantly reduced to around 54 (2017) [12]. The inpatient stay is often very short with good interaction to ambulatory care and free data flow between them. Private healthcare and private hospitals are scarce and rather untypical. Due to short inpatient stay the regions have occasionally been forced to build up own bed capacities for those patients who cannot be cared for in their own home following an inpatient stay.

Finland: Healthcare is organized in regions similar to Denmark. The observed region was Southwest Finland Varha. The health system is tax paid and similar to Denmark the regions are responsible for wellbeing. Additional private health insurance is available and may help to receive faster treatment whereas waiting times are typical in public healthcare. Outpatient care is available either in so called Medic centers or from GP's.

Estland: Estonians have obligatory health insurance (just one exists), paid by the employer and the state. Patients have to pay about 20% from their own pocket, e.g. drugs and dental care. A small private healthcare sector exists. GPs or medical centers receive a per capita fee for each patient who is registered with his GP. Hospitals are in competition, billing for inpatients is DRG based. The largest city Talinn has three mayor hospitals, the University hospital is located in Tartu.

Switzerland: The country consists of 26 Cantons and healthcare is to a large degree a task on cantonal level, resulting e.g. in cantonal hospitals. A basic healthcare insurance is mandatory for everyone, requiring some degree of self-payment per year. Additional insurance may be bought. Some 278 hospitals of various size, including 5 University hospitals exist. GP's and specialists work in their commercially run private practice. A good ambulatory nursing system named Spitex exists.

3.2. IT systems and digitization

Table 2 gives an overview about the IT systems used in the hospitals, the healthcare region respectively outpatient's area and the existence of a national electronic health record.

Table 2. IT system landscape in the respective countries

Country	Hospital IT	Regional IT	Electronic Health Record
United States	EPIC, Cerner	Linkage	None
Denmark	Columna, EPIC	Cura	Sundhed.dk
Finland	Omni, best of breed	Different systems	Kanta
Estland	eHealth.	Via EHR	NHIEP&PACS
Switzerland	Different systems	Different systems	EPD

United States: The hospitals work with 2-3 major IT systems, namely EPIC, Cerner and Meditech. Often Practitioners work part in hospital part in private practice and do hospital clinics. Then, they use seamlessly the same system to document their outpatient

treatment. Hospitals have been merged and thus are often organized in regions or trusts/chains of several hospitals using the same IT system. A linkage called Care Quality (EPIC) or Health Information Exchange (Cerner) exists which permits direct data access between hospitals using the same system. Some exchange between Cerner and EPIC hospitals is possible as well. There is no national electronic health record.

Denmark: A national patient identifier has been established. Hospitals in the regions Midtjylland, Syddanmark and Nordjylland use Columna, a system from a Danish company named Systematic for inpatient and outpatient documentation. Columna shares a database with Cura, the it system used in the region for outpatients. Hospitals in Copenhagen and the surrounding regions Sjaelland and Hovedstaden use the EPIC system. GPs can access the data from Columna based on the Medcom standards for regional communication. Patients have access to a personal electronic patient journal at sundhed.dk with data on lab results, caregivers and data imported from Columna.

Finland: In the observed hospital a best of breed mix of different IT systems was used. A system called Omni (previously Uranus) acts as backbone, containing a live long record of patient data in text form. It is used in most Finnish University hospitals. Helsinki however has an installation of the EPIC system. In all Finland, some 19 different hospital information systems are in use. For regional care data is written to the nationwide Kanta EHR, which, however, according to interview data is rarely consulted by healthcare professionals. A system called SAFIR is used for the emergency department and includes data transfer between ambulance cars and the hospital. Communication between Medic centers and GP's is not fully digitized, paper printed data is still in use.

Estland: All Estonians have an electronic ID and can use it for various tasks such as applying for a driving license. The same ID is used for the national health record. The observed hospital uses a hospital information system (HIS) called eHealth from an Estonian company Nortal, the same system is used in the university hospital in Tartu and a third smaller hospital. A national EHR called NHIEP (nationwide health information exchange platform) exists since 2008 and has Loinc and ICD10 coded patient data in different documents. A new search interface groups this data into disease specific episodes and simplifies the search. The system is used by the healthcare professionals. In addition, a nationwide PACS based on DICOM containing all images of all Estonians exists since 2005.

Switzerland: Hospitals use one of six commercial IT systems. Larger vendors are CISTEC (system KISIM), Nexus, CGM, Meierhofer, or Ines for smaller hospitals. Lately EPIC has been introduced in two Swiss hospitals. The ambulatory Spitex nursing services use own IT systems. GPs are free to select whichever practice information system they want. HIN email is the typical digital communication between inpatient and outpatient areas. A national EHR called EPD exists, but as of now it is used by few patients only. Hospitals must be able to deliver data to the EPD.

3.3. Outcome parameters and subjective assessment of linkage

Let's look at some of the output parameters. Table 3 gives an overview about average life expectancy, preventable mortality - defined as death that can be mainly avoided through public health and primary prevention interventions - per 100'000 population and the author's subjective assessment of linkage between in- and outpatient treatment.

Table 3. Outcome parameters of healthcare and observed subjective quality of seamless care**.** Sources [7,8,9,13,14,15,16], Life expectancy for 2020, preventable mortality (deaths per 100'000 population which could be avoided) for 2018. Linkage inpatient/outpatient as subjective assessment of author

Country	Years Life Expectancy	Preventable mortality/100000	Linkage in-outpatient
United States	77.3	277	Improvable
Denmark	81.6	152	Excellent
Finland	82.2	159	Improvable
Estland	78.6	253	Good
Switzerland	83.1	109	Improvable

4. Discussion

Methods and approach underlying this work are a bit unusual. Information is derived from observations and interviews and thus prone to be subjective. The selection of the visited sites was arbitrary and dependent on positive responses for a two week stay. University hospitals are overweighed. Data from interviews could be incorrect due to misunderstandings and language problems. Some of the statistical data is influenced from the COVID 19 pandemic. The observations were finished in 2023/2024 taking data then available and may not fully reflect todays situation. The observed commonalities reflect correlations, not causalities and may be coincidentally. The parameter "linkage between in- and outpatient care" is a subjective assessment of the author based on the observations and interviews.

Nevertheless, taking Denmark as an example we can note some pro's for a seemingly very good linkage between in- and outpatient care. The following incentives can be observed: a nationwide patient identifier, a tax paid healthcare system, just two different IT systems at the hospital level, and, at least in all three Jylland healthcare regions, a common database (inpatient and outpatient) for healthcare professionals to access the patient data. This concept should be distinguished from national EHR such as Kanta or the Swiss EPD.

In comparison, Finland and Switzerland were both felt to be countries with potential for improvement of the linkage between in- and outpatient care. Here we see some variations. Switzerland has an insurance based healthcare system whereas Finland has a package of municipal health care services for its residents. Growing waiting times have led to considerable additional private spending on health. In both countries we see a variety of different IT systems in hospitals and, certainly in Switzerland also in private practice. Both countries have established an EHR for their patients (Kanta in Finland, EPD in Switzerland). Today the Swiss EPD is not mandatory for patients and in Finland we learned from personal reports that healthcare professionals rely rarely on Kanta healthcare data, e.g. because it is considered incomplete. Considering this, we can assume that the following incentives might be in favor for seamless in- and outpatient care:

- A national patient identifier
- A reduction in the number of hospital information systems
- A common database for healthcare professionals in inpatient and outpatient care which cannot be altered by the patient

Lesser or no effects may be attributed to

- The existence of an Electronic Health Record (EHR) in the hands of the patient
- The existence of a tax paid healthcare system
- Per capita expenditure for healthcare (high in Switzerland, lower in Finland and Denmark)

Obstacles for seamless care seem to be

- Multiple hospital information systems
- Multiple outpatient and GP IT systems

We would like to emphasize that there seems to be no correlation between the seamless healthcare (parameter "linkage between in- and outpatient care") and life expectancy or preventable mortality. Life expectancy is high in Finland, Denmark and Switzerland likewise and preventable mortality is lowest in Switzerland.

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