The State of Integration of Care in Estonia - Operations Manual for Performance Indicators

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List of Datasets Used

- **Inpatient care** billing data, including acute care, nursing care, rehabilitation care, and day care. These datasets include patient information, hospital facility information, doctor information, case information, diagnosis codes and surgical procedures codes.
- **Outpatient care** billing data, including ambulatory specialist care, nursing care, and rehabilitation care. These data sets include patient information, facility information, doctor information and specialty, and diagnosis codes.
- **Primary care** billing data, including patient information, facility information, doctor information, and diagnosis codes.
- **Pharmaceutical prescription** data (for both filled and unfilled prescriptions).
- **Medical procedure** (e.g. diagnostic tests) billing data for inpatient, nursery (both inpatient and outpatient), day care, rehabilitation (both inpatient and outpatient), ambulatory specialist care, and primary health care (separate datasets).

General Data Manipulations

- Data variables were converted from string type (both numbers and letters) to numeric type and vice versa.
- Details:
    - Diagnosis code **subdgn**: Gives the subgroup of ICD 10 diagnosis codes; retrieved using the first three characters of the string variable (e.g.: E10 for all types of Insulin-dependent diabetes mellitus)
    - **unique_case**: Counts the number of actual hospital episodes (i.e.: one hospital episode might be composed of several claims from different departments or hospitals).
    - **history**, or patient episode**:** a single claim observation represents the billing details for one individual patient stay. This variable helps keeping track of transfers to various departments or other hospitals within a single stay.
    - **stay_history**: total length of stay. If there is more than one full day between a discharge and readmission of the same patient, the new admission is considered as the start of a new history.
    - **length** (of stay): collapses the information to single information per patient and history, by keeping the length of stay recovered from the **stay_history** variable.
    - Dummy variables:
        - A dummy variable **death** is generated if date of death is before date of discharge.
        - A dummy variable **acute** is generated if a hospital episode includes an acute inpatient care stay.

Indicators

1. Avoidable Hospital Admissions

Approach: OECD Avoidable Hospital Admissions protocols.

Principles: Hospital admissions for certain diseases, as defined by the International Classification of Diseases (ICD 10) are not justified unless a certain procedure is required, as defined by the Nordic Medico-Statistical Committee Classification (NOMESCO).

Data:

- Avoidable hospital admissions as a share of all admissions for a certain disease group (e.g., avoidable asthma admissions as a share of respiratory disease admissions)
- Age- and sex-standardized population rates

Tracer conditions:

  - Asthma & Chronic Obstructive Pulmonary Disease
  - Diabetes
  - Congestive Heart Failure & Hypertension

Data sources and dataset construction

For the given reference year, the following datasets were used as 'source': **inpatient_nursing_care*year*.dta**, **inpatient_rehabilitationyear.dta**, **day_care*year*.dta**, and **inpatient_care*year*.dta**. In order to account for all relevant admissions that occurred in the given reference year, the same datasets from year-1 and year+1 also needed to be considered, since they might contain some hospital stays for which the admission date actually occurred in the reference year.

Data preparation

"Date variables" for inpatient care (containing information on admission date, discharge date, date of birth, date of death, and patient age) were created in the Stata date format in order to allow for easier comparisons and manipulations. Irrelevant observations (such as observations that have an admission date that does not fall within the reference year) and incomplete observations (such as observations that miss relevant information such as patient insurance ID, patient gender, or patient age) were excluded.

Calculation of the indicators

Dummy variables for each tracer condition were generated, based on the principal diagnosis code dgn1, keeping only the relevant cases for each tracer. E.g. for asthma, an observation was considered relevant

(asthma = 1) if the primary diagnosis code was listed in the OECD protocol on avoidable hospital admissions.

If a relevant reason for exclusion existed (such as the presence of an additional diagnosis code justifying the hospital admission, or the presence of a procedure code indicating a higher degree of complexity of the patient case), the observation was not counted as "avoidable" under this indicator (the dummy variable was set to 0).

The auxiliary variables **history**, **unique_case**, **death**, **length**, and **acute** (see the detailed explanation under General Data Manipulations) were constructed.

The OECD Health Care Quality Indicators (HCQI) - 2012-2013 Data Collection Guidelines were followed in the construction of the indicator.

2. Extended Hospital Stays

Approach: UK NHS outcomes framework

Principles:

- Proportion of patients discharged back to usual place of residence within a certain time period after admission to hospital.
- Laparoscopic cholecystectomy discharges per 1,000 cholecystectomy discharges

Tracer conditions:

- Cholecystectomy
- Stroke
- Hip Fracture

Data sources and dataset construction

For the given reference year, the datasets used as 'source' are **inpatient_nursing_care*year*.dta**, **inpatient_rehabilitationyear.dta**, **day_care*year*.dta**, and **inpatient_care*year*.dta**. In order to account for all relevant admissions that occurred in the given reference year, the same datasets from year-1 and year+1 are also considered, since they might contain some hospital stays for which the admission date actually occurred in the reference year.

Data preparation

"Date variables" for inpatient care (that contain the information on admission date, discharge date, date of birth, date of death, and patient age) were created in the Stata date format (in order to easily allow for comparisons and manipulations). Irrelevant observations (observations that have an admission date that does not fall within the reference year) and incomplete observations (observations that miss

relevant information patient insurance ID, patient gender, or patient age) are excluded from the dataset.

Calculation of the indicators

Identification of Tracer Conditions

Dummy variables stating whether the observation belongs to the given tracer were generated for each tracer condition (based on the principal diagnosis code dgn1). For example, for hip fracture, an observation is deemed relevant (hip_frac = 1) if the primary diagnosis code belongs to the list of codes stated in the OECD protocol on incomplete hospital discharges.

Computation of Indicators

For each tracer condition computation, the auxiliary variables **history**, **unique_case**, **death**, and **length** (see the detailed explanation above under General Data Manipulations) are constructed. The patient history was computed by generating linked episodes within the same hospital stay that did not differ in more than one day between discharge and admission (unless the patient went home, which started a new episode). By identifying all episodes (e.g. an inpatient stay followed by a nursing stay within the same hospital stay), a history with a length of stay was identified and summarized for each tracer condition and any other covariates considered.

3. Avoidable Ambulatory Specialist Visits

Approach:

- Internationally, there is no universally accepted protocol or indicator to determine the validity or need for a specialist visit. Still, there is a general consensus that a large number of specialist visits are avoidable. In consultation with international experts, a protocol was developed.

Principles: Patients with certain diseases (ICD 10) do not require visits with certain medical specialists.

Tracer conditions:

  - Diabetes
  - Hypertension

Data sources and dataset construction

For a given reference year, the datasets used as 'source' were outpatient visits and outpatients procedures, namely **outpatient*year*.dta** and **outpatient_procedures*year*.dta**. In order to account for all relevant specialist visits that occurred in the given reference year, the same datasets from year-1 and

year+1 also need to be considered, since they might contain some specialist visits which actually occurred in the reference year.

Data preparation

The code identifies relevant visit types (first-time visits, follow-up visits, and home visits) from the **outpatient_procedures*year*.dta** datasets only and excludes the rest. Finally the data is merged with outpatient visits through the billing number to create **outpatient*year*_edited.dta**. Some variables were renamed and reshaped. "Date variables" for outpatient care (that contain the information on treatment dates, date of birth, date of death, and patient age) were created in the Stata date format (in order to easily allow for comparisons and manipulations). Irrelevant observations (i.e. observations that have a visit date not within the reference year) and incomplete observations (i.e. observations that miss relevant information such as patient insurance ID, patient gender, or patient age were dropped from the dataset.

Calculation of the indicators

Estonian, NHS (UK), and American guidelines for diabetes and hypertension were reviewed to determine criteria for **specialist referrals**. These guidelines are summarized below:

Hypertension	
Guideline	**Criteria for specialist referral**
Estonia	Age <30, blood pressure not at goal despite use of optimal doses of 3 medications
NHS (UK)	Age <40, signs of secondary cause, blood pressure not at goal despite use of optimal doses of 4 medications
USA (JNC 7 & JNC 8)	Blood pressure not at goal despite use of optimal doses of 3 medications

Diabetes	
Guideline	**Criteria for specialist referral**
Estonia	Requirement of insulin injections, annual ophthalmologist visit
NHS (UK)	Type 1 diabetic, (type 2 stabilized on insulin should be referred back to primary care),
USA (ADA)	Type 1 diabetes in a child, annual ophthalmologist visit

All ICD 10 codes for hypertension and diabetes were reviewed and categorized as meeting criteria for care at the primary care level vs. specialist level. Primary care level HTN diagnoses included essential HTN codes that did not specify renal failure or congestive heart failure. Specialist level codes included diagnoses associated with complications of HTN. Insulin dependent diabetes without complications was

included in the specialist level of codes so as not to include type 1 diabetics in the primary care category. Any diabetes code associated with renal or other complications was included in the specialist category.

The complete list of medical specialties in Estonia was reviewed. Each specialty was categorized as: necessary for an uncomplicated patient (e.g. ophthalmology and pediatrics for diabetics), unnecessary for an uncomplicated patient (A1), or outside of the scope of the disease (A2, e.g. neurosurgery for a diabetic). A similar process was repeated for complicated patients, categorizing specialists as necessary (given the theoretical spectrum of disease) or outside of the scope of disease (A2).

Since all insulin dependent diabetics were categorized as "complicated" (warranting specialist visits by the national guideline), and this should account for pediatric patients, no further age exclusion was added to the determination of unnecessary visits for diabetes.

Hypertensive patients below the age of 30 were removed from the unnecessary specialist visit category to adhere to the Estonian guideline on this issue. In a future round of analysis, e-prescription data can be used to further remove patients who are taking three or more anti-hypertensive medications, since they may need specialist management for otherwise uncomplicated blood pressure control.

To determine the rate of unnecessary visits for these conditions, the total number of unnecessary specialist visits as defined above was divided by the total number of specialist visits (for both complicated and uncomplicated diagnosis codes). A2 specialist visits were excluded from the denominator.

[A1 (uncomplicated dx codes)] / [A1 (uncomplicated) + Necessary (uncomplicated) + Necessary (complicated)]

A specialist visit is deemed to be avoidable based on the primary diagnosis code made and taking into account national Estonian guidelines. Uncomplicated cases of the tracer condition leading to specialist visits are considered to be avoidable, unless otherwise specified by Estonian guidelines. Two visit categories per tracer condition were created (tracer in an uncomplicated form and in a complicated form) by using diagnosis codes, with reshaping required to translate specialist names from Estonian to English. Finally, by disentangling these two types of categories, the indicator was computed by dividing for each tracer condition the number of uncomplicated cases by the total number of cases. The indicators were computed at the aggregate countrywide level but also across different hospital types.

4. (Usual) Provider Continuity

Approach: Canadian Institute for Health Information

Principles: The frequency and sequence of visits with primary care providers versus ambulatory specialists.

Tracer populations:

- General population seeking care aged >= 18
- Diabetes aged >= 18
- Hypertension aged >= 18
- CVD aged >= 18

Data preparation

Continuity of Care

For a given reference year, the datasets used were: **primaryhealthcareyear.dta**, **primaryhealthcare_proceduresyear.dta**, **outpatienyear.dta** and **outpatient_proceduresyear.dta**. Information on primary health procedures and primary health care visits was merged for all years, as was information on outpatient procedures and outpatient visits. All data was finally appended and harmonized.

The list of diabetes, hypertension, and CVD patients was constructed based on diagnosis codes from in- and outpatient care. Any patient that did not die before the end of the reference year and was recorded in at least one inpatient or outpatient care visit with a relevant diabetes, hypertension, or CVD code during the reference year or the preceding year (in order to take account of patients not seeking care regularly) was included in the list of patients.

Calculation of the indicators

The visit types considered in the construction of the indicator were: Family Doctor, Ambulatory Specialist, Nurse, Home visits (excluding dentist visits).

The following measures were created and computed for the different patient groups cited above:

i. Average number of outpatients visits per year
ii. Percentage of outpatient visits that occur with ambulatory specialists.
iii. Average number of consecutive specialist visits by patient before seeing a GP again
iv. Average number of consecutive GP visits by patient before seeing a specialist again

5. Under-provision of Preventive Services

Approach: National Australian Performance Framework

Principles: Compliance with national clinical guidelines

Tracer conditions:

- Diabetes
- Hypertension

Construction of the indicator: % of patients receiving diagnostic tests and counseling for secondary disease screening and prevention.

Data sources and dataset construction

The list of diabetes and hypertension patients that should receive preventive services was constructed based on diagnosis codes from in- and outpatient care. Any patient that did not die before the end of the reference year and was recorded in at least one inpatient or outpatient care visit with a relevant diabetes or hypertension code during the reference year or the preceding year (in order to take account of patients not seeking care regularly) was included in the list of patients. This list of patients was saved in the dataset **comorbidities_selfmgmtXXXXandXXXX.dta.**

Next, information on all relevant preventive tests carried out by family physician doctors and ambulatory specialists was obtained from datasets **primaryhealthcare_proceduresyear.dta** and **outpatient_proceduresyear.dta** for a given reference year.

Data preparation

All irrelevant test procedures were excluded from datasets of outpatient and primary care procedures and "date variables" were added. Only test procedures from specialist types to which a visit of either a hypertension or a diabetes patient could be justified were considered. The datasets with outpatient visits and outpatient procedures as well as with family physician visits and family physician procedures were merged.

Calculation of the indicators

For any patient that did not die before the end of the reference year and that was recorded at least once with a relevant diabetes or hypertension diagnosis code during the reference year or the preceding year, the number of each of the relevant preventive tests received was calculated taking into account i) only the tests received from family physician doctors, and ii) the tests received from both family physician doctors as well as ambulatory specialists. Finally, for both hypertension and diabetes patients, the percentages of i) patients receiving none of the tests recommended in Estonian guidelines and ii) patients receiving all the tests recommended in national guidelines were calculated.

6. Incomplete Discharges

Approach:

- OECD Protocol to quantify incomplete discharges.
- Guideline – Management of Cardiovascular Risk (New Zealand).

Principles: Compliance with international treatment guidelines.

Tracer conditions:

- Acute Myocardial Infarction
- Heart Failure
- Unstable Angina

Prescriptions considered:

- Beta blockers
- ACE inhibitors
- Statins

Data sources and dataset construction

Two datasets were used as 'source' for the given reference year:

- Information on inpatient care visits collected through **inpatient_care*year*.dta**, **inpatient_rehabilitation*year*.dta**, **day_care*year*.dta**, and **inpatient_ nursing_care*year*.**dta.
- Information on prescriptions of medication, including both filled and unfilled prescriptions.

Data preparation

"Date variables" for inpatient care (information on admission date, discharge date, date of birth, date of death, and patient age) were created in the Stata date format (in order to easily allow for comparisons and manipulations). Irrelevant observations (observations that do not have an admission date from the reference year) and incomplete observations (observations that lack relevant information such as the patient insurance ID, patient gender, or patient age) were dropped from the dataset. "Date variables" for filled prescriptions (containing information on the prescription date and purchase date) and unfilled prescriptions were created as well.

Calculation of the indicators

For each tracer, the list of relevant cases to be considered was established as follows. Only cases of patients that had an acute inpatient stay and a relevant primary diagnosis code (not a secondary etc.) were considered. Furthermore, patients that died within 90 days of the final discharge were excluded from the analysis.

For each of the patient cases that complied with the above conditions, any prescription made during the entire inpatient care episode (not only during the last stay before the final discharge) is considered as a valid prescription. In a second step, all prescriptions that were made within 30/90 days of the acute inpatient care stay (i.e. prescriptions made during outpatient care visits) were considered. When

accounting for prescriptions that were actually filled, any purchase date was considered valid (i.e. all prescriptions were counted irrespectively of the date when the prescription was actually filled).

For all tracer conditions, the rate of patients that were prescribed beta blockers, ACE inhibitors, statins, not a single prescriptions at all, or all 3 prescriptions i) during their inpatient stay, ii) within 30 days of their discharge and iii) within 90 days of their discharge was calculated. The same calculations were carried out only accounting for prescriptions that were actually filled.

7. Inadequate Acute Inpatient Follow-up Care

Approach: Protocol established in the literature (US)[1]

Principles: Follow-up within recommended post-acute inpatient interval

Tracer conditions:

- AMI
- Heart Failure
- Cholecystectomy
- Stroke
- Hip Fracture

Data sources and dataset construction

For a given reference year, the datasets used as a "source" were: inpatient visits (including **inpatient_nursing_care*year*.dta**, **inpatient_rehabilitationyear.dta**, **day_care*year*.dta**, **and inpatient_care*year*.dta**), outpatient visits (**outpatient*year*.dta**), outpatient procedures (**outpatient_procedures*year*.dta**), primary care visits (**primaryhealthcare*year*.dta**) and primary care procedures (**primaryhealthcare_procedures2013.*dta***). In order to account for all relevant visits that occurred in the given reference year, the same datasets from year-1 and year+1 also needed to be considered, since they might contain some hospital stays for which the admission date actually occurred in the reference year.

Calculation of the indicators

For each tracer, the list of relevant cases to be considered was established as follows. Only cases of patients that had an acute inpatient stay and a relevant primary diagnosis code (not a secondary etc.)

[1] Lin et all. (2011) - Physician Follow-Up Visits After Acute Care Hospitalization for Elderly Medicare Beneficiaries Discharged to Non-institutional Settings.

were considered. Furthermore, patients that died within 90 days of the final discharge were excluded from the analysis.

For each of the patient cases that complied with the above conditions, corresponding follow-up visits were calculated as follows. An outpatient care visit only counted as a follow-up visit in case it occurred before the next inpatient care episode of a patient. Any visit with either an ambulatory specialist or a family physician doctor during which a diagnosis (not necessarily the primary one but any diagnosis) relevant to the tracer condition was made within up to 90 days of the acute inpatient episode was considered a valid follow-up.

For all tracer conditions, the rate of follow-up visits to either (i) family physician doctor or (ii) family physician doctor/ambulatory specialist within a period of either (a) 30 or (b) 90 days after the final acute inpatient care discharge was calculated.

8. Unnecessary Preoperative Diagnostic Tests

Approach: UK NHS outcomes framework, authored by NICE.

Principles: To identify unnecessary pre-operative tests performed on patients undergoing one of five selected tracer surgeries.

Tracer conditions:

- Cataract surgery
- Lumpectomy
- Hernia repair
- Cholecystectomy
- Hip fracture

Data sources and dataset construction

For a given reference year, the datasets used were:

- Inpatient visits billing data (including **inpatient_nursing_care*year*.dta**, **inpatient_rehabilitationyear.dta**, **day_care*year*.dta**, **and inpatient_care*year*.dta**)
- Medical procedures billing data: (including **inpatient_nursing_care_procedures_*year*.dta**, **inpatient_rehabilitation_procedures_dates_*year*.dta**, **day_care_procedures_date_*year*.dta**, and **inpatient_care_procedures_date_*year*.dta**)

- Outpatient visits and procedures billing data (**outpatient_procedures*year*.dta**, **outpatient_rehabilitation_procedures_date_*year*.dta**, **outpatient*year*.dta**, **outpatient_rehabilitation*year*.dta)**
- **Primary health care visits and procedures billing data** (**primaryhealthcare*year*.dta** and **primaryhealthcare_procedures*year*.dta**).

Data preparation

In order to match the NICE guideline's approach to patient co-morbidity classification we utilized the guideline's proxy for ASA level and limited our analysis to cardio-vascular disease (hypertension, diabetes, angina, and exercise tolerance), respiratory disease, and renal disease. ICD-10 codes pertaining to these disease processes were analyzed and where possible categorized according to mild disease (ASA 2) and moderate to severe disease (ASA 3). Diagnosis codes for exercise tolerance, COPD, and asthma could not be stratified according to severity since the diagnosis codes were not differentiated in this way. Patients in the EHIF data set who underwent a tracer surgery were then assigned an ASA category based on the diagnosis codes associated with their medical record at the time of admission for surgery or any time during the calendar year of the surgery or the preceding calendar year.

Pre-operative tests were deemed unnecessary based on both patient factors (age and co-morbidities) and the types of surgery and tests being performed according to the guideline used by the UK National Health Service (NHS).

Calculation of the indicators

Eventually, tests were counted as unnecessary, if they were performed up to 30 days before the surgery considered on a patient whose surgical grade, age, and ASA category (as considered from renal, cardio-vascular or respiratory co-morbidities) did not warrant the test according to the NICE guideline. If a patient had 2 different tracer surgeries in the timeframe considered (e.g.: 2 cataract surgeries), only tests that took place after the 1st surgery were checked for their necessity as a preparation for the 2nd surgery.

Breakdown Analysis

Income Quintile analysis:

Income quintiles were constructed based on *Kaja Sõstra, and Julia Aru, "Regional poverty mapping", in Eesti Statistica (2013), Regional Development in Estonia 2013, Tallinn.* Income quintile 1 is the poorest

one as measured by per capita household income; quintile 5 is the richest one as measured by per capita household income.

Urban/rural analysis:

Municipalities in Estonia are of two types: urban municipalities or towns and rural municipalities or parishes. The analysis makes use of this distinction and a patient's registered place of living.

Ethnicity analysis:

Ida-Viru County is the most north-eastern part of the country. Close to 80% of the population are of Russian origin and have limited command of the Estonian language. The analysis uses patients' residence in Ida-Viru as a proxy for disaggregating results according to patients' ethnicity.

Self-management Impairment analysis:

Comorbidities that potentially impair a patient's capacity to self-manage their conditions were identified using any diagnosis code that was made for the patient during the reference year or the preceding year. Three chronic conditions were considered: (i) depression; (ii) dementia; (iii) disability through vision and hearing loss.

The different chosen breakdowns differ considerably from each other in terms of their age and gender composition. Age-sex standardizing the different indicator breakdowns takes into account these differences.