



DELIVERABLE A: MAP OF THE CURRENT HOSPITAL SYSTEM

**Person-Centred Integrated Hospital Master
Plan in Estonia (REFORM/SC2019/140)**



This project is carried out with funding by the European Union via the Structural Reform Support Programme and in cooperation with the DG REFORM

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Disclaimer

The views expressed in this report are those of the consultants and do not necessarily reflect those of the European Union

This project is implemented by AARC



Abbreviations	
APN	Advanced practice nurse
EBITA	Earnings before interests, taxes and amortisation
ECG	Electrocardiography
ED	Emergency department
EHIF	Estonian Health Insurance Fund
EHIS	Estonian nation-wide Health Information System
EHR	Electronic Health Record
EMR	Electronic Medical Record
ER	Emergency room
ETCH	East Tallinn Central Hospital
EU	European Union
FD	Family doctors
FFS	Fee for service
FTE	Full time equivalent
GIA	Gross internal area
HIF	Health insurance fund
HNDP	Hospital Network Development Plan
HNRC	Haapsalu Neurological Rehabilitation Centre
HR	Human resource
HWISC	Health and Welfare Information Systems Centre
IC	Intensive care
IVCH	Ida-Viru Central Hospital
LINAC	Linear accelerator
MoSA	Ministry of Social Affairs
NEMC	North Estonian Medical Centre
NIHD	National Institute for Health Development
OECD	Organisation for Economic Co-operation and Development
TNM	Tumour Node Metastases
PHC	Primary health care
RfS	Request for Service SRSS/SC2019/140

SEH	South Estonia-Hospital
TCH	Tallinn Children's Hospital
TUH	Tartu University Hospital
UE	User Experience
UI	User Interface
WHO	World Health Organization
WTCH	West Tallinn Central Hospital

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1. Executive summary

The overall vision for people-centred health care is one in which individuals, families, and communities are served by and able to participate in trusted health systems that respond to their needs in humane and holistic ways. The health system is designed around stakeholder needs and enables individuals, families, and communities to collaborate with health practitioners and health care organizations in the public, private, and not-for-profit health and related sectors in driving improvements in the quality and responsiveness of health care.

People-centred health care is rooted in universally held values and principles which are enshrined in international law, such as human rights and dignity, non-discrimination, participation and empowerment, access and equity, and a partnership of equals. It aims to achieve better outcomes for individuals, families, communities, health practitioners, health care organizations and health systems by promoting the following:

1. A culture of care and communication. Health care users being informed and involved in decision-making and having choices; providers showing respect for their privacy and dignity and responding to their needs in a holistic manner.
2. Responsible, responsive, and accountable services and institutions. Providing affordable, accessible, safe, ethical, effective, evidence-based and holistic health care.
3. Supportive health care environments. Putting in place appropriate policies and interventions, positive care and work environments, strong primary care workforce, and mechanisms for stakeholders' involvement in health services planning, policy development and feedback for quality improvement.¹

The purpose of this report, in accordance with the project Request for Service, is to set out a comprehensive map of the hospital sector of the Estonian health care system. In addition, as a person-centred approach presumes a holistic view from the patients and their relatives' standpoint to the health and social system, the report also covers some aspects of the interactions between hospitals and other parts of the system in the mapping. The overall axis of the approach has been the assumption that effective person-centred care is possible only within an overall paradigm of an accessible, safe, good quality but also cost-efficient and sustainable health care system.

The report includes a quantitative health map (see Table 1) to create a visualised overview of the hospital system, and a formulated list of findings that need to be discussed on the background of the person-centredness goal and taken as an input for the next phases of the project, and more specifically an estimation of future needs for health care workforce and facilities infrastructure as well as policy scenarios development.

¹ https://apps.who.int/iris/bitstream/handle/10665/206971/9789290613176_eng.pdf?sequence=1&isAllowed=y

The optimisation of the hospital system foreseen by HNBP2015 has been mostly successfully implemented, allowing to aim at more advanced goals of person-centredness and operational efficiency of health care.

The low quality of clinical data and outdated pattern of information flow is limiting the person-centredness and continuity of care, being also influenced by vague definitions of roles and responsibilities in service delivery. Hospitals are looking for the government to coordinate data normalisation and standardisation as well as better governance and coordination of health information system developments.

The patient environment in most hospitals does not fully meet modern standards and appropriate separation of patients, which is especially important in the background of the ongoing Covid-19 pandemic. Less than half of all beds are in patient rooms equipped with separate bathrooms, and a bit more than half of all beds are in the patient rooms with 1-2 beds.

The hospital system in general is functioning optimally to deliver good quality effective health care services, with the potential for enhanced patient-centredness. However, general hospitals with smaller and decreasing catchment population have clear issues with financial sustainability and ability to reinvest into technology and buildings, if they continue to operate with the current service mix and financing model.

General system level findings

The main factor influencing overall demand for health services and its case-mix is demographics. The total Estonian population has decreased by 241,623 people or approximately 15% in the last 30 years, with urbanisation to Tallinn and Tartu (incl. their surroundings), and other Estonian counties losing 14 to 39% of population. At the same time the population, in particular outside those two metropolitan areas, is rapidly aging, with the 65+ age group increasing by 84,683 people. From the point of health service volume needs, this increase is balancing the decrease in total population as health care consumption of 65+ is approximately 4-fold of younger age groups, although differs substantially in service-mix towards chronic conditions, rehabilitation, and nursing. The latter emphasises even more the importance of proper person-centred coordination between PHC, hospitals and social services.

To provide a person-centred health care an optimal medical equipment and infrastructure environment is necessary. Estonia has been praised by international organizations like the World Bank and WHO for its efficient health care reforms. The Hospital Master Plan 2015² that was implemented by the government decree in the form of National Hospital Development Plan³, and the extent the plan has been implemented is exceptional on global level. However, some parts addressed by the plan are still to be realised. The service mix and coordination with PHC at county level, in particular in the case of hospitals with smaller catchment population, has not been optimised, and the patient environment in most hospitals does not meet modern standards. Only 47% of all beds in hospitals are in the patient rooms with bathrooms. 54% of beds are in patient rooms with 1-2 beds. 75% of patient rooms have 2 beds or less. These criteria are not only important from the patient experience aspect, but even more as preventive

² <http://rahvatervis.ut.ee/handle/1/2049>

³ <http://rahvatervis.ut.ee/handle/1/2049>

measures connected with patient security (avoiding hospital infections), especially today in the context of the COVID 19 pandemic.

On the other side, international benchmarking indicates that the Estonian health care system is at a comparable level with international peers, and equipped with all major high-cost imaging and treatment technologies, except 5 LINAC systems per 1 million population (Denmark 13, Sweden 7, Finland 10). The overall number of doctors per 1000 population (3,5) is at par with the OECD average and somewhat less than in Nordic neighbours Denmark and Sweden (4,2-4,3). However, the health care system is more hospital-centred. In the OECD and EU, on average there are 1,5 and 2,2 doctors per 1000 population working in hospitals compared to 2,2 in Estonia.

Estonian health care is not only hospital-centred but is also a doctor-centred system. There are in total substantially fewer nurses per 1000 population in Estonia (6,6) than in EU and OECD (8,4 and 10,1). The difference with Netherlands (11,4) and Sweden (11,6) is even more drastic. However, the number of nurses per 1000 population working in hospitals (4,7) is close to EU, OECD (4,9 both) and Netherlands (4,5) but app 50% less than in Denmark (7,2). The doctor-centric feature of Estonian health care system is also expressed by nurses/doctors in total ratio, which in Estonia is 1,8 compared to 2,5-2,6 in EU, OECD, Sweden, Denmark and 3,0 Netherlands, as well as the ratio for nurses/doctors in hospitals – 1,9 in Estonia vs 2,3 in Denmark, 2,6 in EU, OECD, or 3,4 in Netherlands.

From a person-centredness view, the number of nurses involved in treatment process is important, as nurses should be a primary contact point to communicate with patients and patients' relatives. Our survey with hospital staff revealed that time constraints was one of the reasons for inadequate communication by doctors with patients, and nurses have an increasing role to provide updated information to patients. In this respect, nurses and social workers have an advantage over doctors, as their training pays significantly more attention to developing patient communication skills.

On the other side, in our survey with patients, they assessed the communication with hospital staff mostly as “good” or “very good”, including engagement of patients into planning of medical interventions and communicating potential risks and treatment alternatives, if such exist. However, coordination of communication and process of after-care was assessed less positively by the interviewees.

The basis for effective and sustainable person-centred health care is availability and adequacy of data and active information flow between different service providers in the system in order to secure coordination and continuity of care. Unfortunately, hospitals, primary care service providers and social support system in Estonian do not share common goals in patient treatment. Common treatment and care plans are not established, and common planning and coordination is not financially supported.⁴ In addition to the shortcomings in data collection and information exchange, the contracting and payment system used by EHIF does not support a comprehensive approach to care coordination between different health care providers and social care providers.

The current system may confuse patients in finding optimal access to health care system and patient may get stuck between different levels of care. This was also confirmed by our survey among the staff in selected panel hospitals. Continuity and integration of the care is a challenge,

⁴ “Toward greater integration of care and improved efficiency” <https://haigekassa.ee/haigekassa/ceesti-haigekassa/uuringud-ja-analysid>; “Reducing the burden of care in Estonia” https://www.riigikantselei.ee/sites/default/files/content-editors/Failid/hoolduskoormus/estonia_ltc_report_final.pdf

mainly between the PHC and hospital service provision (according to HWISC statistics only ca 55% of referral letters given by family doctors are actually used by patients during first 3 months). The quality of patient records, information exchange between service providers and lack of responsibility in coordination of the care was critically assessed by stakeholders. This affects also patient centredness and the efficiency of the care delivery.

The low quality of clinical data and the outdated pattern of information flow are limiting the continuity of care. Our interviews with hospitals and other stakeholders showed that clinical data in the vast majority is not collected in a standardized or structured way and is mainly registered as free text. Hospitals are looking for the government to coordinate data standardization. There is no data exchange with systems of other healthcare facilities on the patient, except through the Nation-wide Health Information System (Digilugu) and Estonian Healthcare Image Bank (Tervishoiu Pildipank). However, these systems support the exchange of completed clinical activities only when the patient case is finalised, which substantially limits real-time use of data for clinical decision making during an ongoing episode of care.

There is only one form dedicated for people to enter their own health data – Health Declaration. The health data collected directly from a person is used only for the health certificate issuing. Availability of self-triage tools is limited. Patient and their family members could be much more efficiently engaged in the treatment process if self-triage tools and patient-centred treatment and care plans for multimorbid patients were available.

Systemic weaknesses in cross-sectoral regulation, coordination, and standardization limit the secondary use of health data, which in turn creates a need for manual data processing and ends up with material inefficiency in information handling and system developments. Hospitals often use several software applications for administrative data, and automated integrations with medical recording systems are not in place. Lots of manual data entry is needed for the reporting and statistics. In most hospitals, the raw data are all electronic, but it is manually transferred for reporting and statistics.

Regulations on health information system, prescription system, reimbursement system, public health reporting system, or to vertical registries (Cancer, HIV, tuberculosis, myocardial infarction, etc. registries) are not harmonized and define only general classes of clinical information. Each responsible agency, specialty or sector develops their terminologies and data structures independently, which leads to point-solutions and increases the burden for software development or manual data processing. For example, one of the main processors - HWISC - applies only technical quality checks on incoming documents, this only helps to verify the document structures, but not the quality of clinical content in the document.

One sample source of inefficiency is having a separate channel for reporting cases and case statistics for public health. Firstly, the Institute for Health Development (NIHD) collects most of their data through an internet portal, which is a legally mandated data entry system for hospitals. This portal, in combination with other data collection systems (Health Information System), can be seen as a redundant system for duplicate entry. The collected data should be / is often available in other systems, but due to the gaps in data quality and in interoperability it cannot be automatically transferred to the NIHD databases. Secondly, data entered directly into NIHD systems and cleansed for better quality there is not shared back in an interoperable way to clinical / administrative healthcare systems. This limits the value added by the strong data analytics capability of NIHD. NIHD, even if processing case level health data, is not able to contribute to the general quality of clinical and administrative decision making in the hospitals. Financial reporting of healthcare institutions must follow the rules of the Estonian Health Insurance Fund (EHIF). EHIF has also introduced its own classification of healthcare activities

(services) which are reported through electronic channels allowing only specific EHIF provided messaging specifications.

A major part of hospital revenues are based on DRG-s. The current DRG tariffs are defined based on average costs of the previous year from a sample of hospitals, which are not aligned with the costs of providing care in line with clinical guidelines. The government has not been able to create a systemic approach in the development and regular revision of treatment guidelines and their implementation in financial incentivisation aiming for person-centred comprehensive care. A proof on this is that the services are not provided at optimal level of care or are not justified. For example, during last 10 years the provision of laboratory tests has moved gradually from outpatient settings toward inpatient settings. In addition, in 2014-2015 the WB has reported on average in all HNPD hospitals in 23% of cases at least one pre-surgery unjustified examination was performed taking into account the patient's age or systemic comorbid condition.⁵

The absence of adequate social care services can significantly increase the need for health care, and therefore cause an increase in health care costs⁶. HNPD hospitals provide marginal share of social services. The WB report 2017⁴ and our interviews indicated that the technical and juridical restrictions for patient level data exchange and fragmented financing are major reasons why the development of integrated and person-centred care is suffering.

According to the WB analysis based on the OECD HCQI diagnoses list in 2015, 26% of general hospital Group 2 and 20% of general hospital Group 1 admissions were avoidable (13% in regional hospitals and 16% in central hospitals)⁴. In order to achieve more efficiency, EHIF has reduced inpatient care volumes. Despite of that expenditure on the inpatient care has increased. Using the 2016 updated OECD HCQI tool, our task group conducted a follow-up screening of the EHIF 2019 dataset and found some 5% improvement in both general hospitals' groups (21% in Group 2 and 15% in Group 1).

Sound early rehabilitation care is a missing part in the Estonian health care system⁷. Although by health care organization family doctors have responsibility to take care of the patient after a hospital care episode, they are not actively informed of the discharge of their patients. There is unused potential in improving home care, psychiatric home nursing, and home rehabilitation services. Digital services and solutions for home monitoring are not in place.

The mapping of governance of HNPD hospitals indicated to several limitations in the current governance practice: (1) governance is seen mostly as a traditional monitoring and supervisory function only, (2) founders have limited capacity to provide strategic input for setting strategic direction and there is very little leadership and professional support to executive teams, (3) governance covers mostly monitoring of financial performance and not health care service quality, clinical operations and integration with other service providers and continuity of care.

The capacity of governing bodies to ensure high quality HNPD hospital governance is a challenge. The skills, knowledge and experience of the board members are not balanced for effective governance. No standards for good governance practice incl. qualification requirements for board members nor mechanism to balance political and professional

⁵ Indicator "Tarbetud operatsioonieelsed diagnostilised uuringud" <https://haigekassa.ee/eesti-tervishoiususteemi-integreerituse-hindamise-indikaatorid>

⁶ "Reducing the burden of care in Estonia" https://www.riigikantselei.ee/sites/default/files/content-editors/Failid/hoolduskoormus/estonia_ltc_report_final.pdf

⁷ Indicator "Statsionaarse aktiivravi järgne puudulik jätkuravi" <https://haigekassa.ee/eesti-tervishoiususteemi-integreerituse-hindamise-indikaatorid>

representation exists. The practice of self-assessment of governing performance by the boards is irregular and not systematic.

Hospital group level findings

The original Hospital Master Plan 2015 has not been fully implemented. The HNBP approved in 2002 is grouping the hospitals based on catchment population into 4 levels:

1. Regional hospitals with catchment population 0,5-1 million;
2. Central hospitals with catchment population 100 000-200 000;
3. General hospitals with catchment population 50 000-100 000;
4. Local hospitals with catchment population up to 40 000 and within 70km or 1hour drive reach to a higher level hospital.

According the initial version of the HNBP there was foreseen to have 3 local hospitals (Jõgeva, Põlva and Rapla) and 9 general hospitals (Järvamaa, Kuressare, Läänemaa, Rakvere, SHE (Võru), Narva, Viljandi, Valga, Hiiumaa) in the country. In practice there is today formally only one local hospital and the other two have got a general hospital status despite insufficient catchment population already in 2002. Also, a number of general hospitals on the list (Läänemaa 29 000 population, Valga 35 000, Järvamaa 37 000, Rapla 38 000) didn't actually meet the set catchment population threshold back then, while Kuressaare and Hiiumaa hospitals being in a special situation due to locating on islands. With the demographic situation changing outside Tartu and Harju counties, the catchment population of those above listed hospitals have been shrinking even further. The effective catchment population is even smaller than the formal population as an increasing share of people is looking for specialised health care services outside their home county. Therefore, the actual minimal service population for general hospitals sustainable operation can be arbitrarily drawn at 20 000 people. In this case only 5 hospitals (Kuressare, Rakvere, Viljandi, Narva, SEH) will qualify to a general hospital status level. The minimal service population is important to consider while looking to the capacity of a hospital to deliver cost-efficient quality person-centred specialised health care.

Our mapping indicates that several of the above-mentioned smaller hospitals have problems with sustainable staffing to secure quality health care services: (1) all Group 2 hospitals need considerably more doctors to fill a FTE than bigger hospitals (FTE/Heads ratio from 0,62 to 0,75 compared to 0,8-0,9 for Group1 or 0,81-0,91 for central hospitals; (2) the nurses to doctor (FTE) ration in most Group 2 general hospitals is less than 2,5 that has been taken as lower threshold for optimality by our working group;⁸ (3) the doctors' median age working in Jõgeva, Hiiumaa, Järvamaa and Narva hospitals is in the range of 56 to 62 years pointing to potential future problems in recruiting new staff (median age of doctors' in regional hospitals is from 42 to 54 and in central hospitals 48,5-52,5).

There is still lot of room for more efficient use of hospital infrastructure and staff. HNBP 2002⁹ has set bed occupancy target of 83% in acute hospitals, excl. psychiatry, TBC and nursing by 2015. As of 2018, only few hospitals had bed occupancy above 80%, while all but two Group 2 hospitals (Hiiumaa and Rapla hospitals) have bed occupancy below 70 % (range 45% in Jõgeva to 67% in Põlva Hospital).

In 2019, the share of avoidable hospitalisations has decreased in all hospital groups compared to 2015, being still substantially higher in Group 2 general hospitals. The improvement has been remarkable in two hospitals that have been networked with NEMC during this period

⁸ Regional and central hospitals have due to considerably higher technology intensity service profile lower nurse/doctor FTE ratios, less than 2 for regional and 1,8-2,6 for central hospitals

⁹ <http://rahvatervis.ut.ee/handle/1/2049>

(Raplamaa Hospital from 36% to 28% and Läänemaa Hospital from 30% to 21%) but stays high in Valga Hospital (31%) and Jõgeva Hospital (28%).

The Hospital Master Plan (HMP) 2015 proposed the gross area per bed goals for hospital groups that were assessed rather ambitious at the time: for regional hospitals 120-130 m²/bed, central hospitals 110-120 m²/bed and general hospitals 90-100 m²/bed. The area less than the set standard in a hospital would mean suboptimal conditions for the staff and patients, while above the standard area per bed can indicate to potential inefficiency in using the infrastructure.

Today, all hospitals but Pärnu Hospital among regional and central hospital groups have the area per bed above the set target by HMP2015. This is most probably connected with developments in medical technologies and the increasing share of outpatient and day treatment. TCH is the only hospital in this group of hospitals, where the per bed gross area (233 m²) seems to be too high to be optimal. In general hospitals Group 1 Rakvere Hospital stands out with over 30% area per bed over the proposed standard and Viljandi Hospital having sub-standard conditions. In Group 2 there are some sub-standard hospitals (Järvamaa, Rapla, Läänemaa and Hiiumaa) and three hospitals with obvious inefficiencies in operating the infrastructure (Jõgeva 18%, Põlva 31% and Valga Hospital 88% (!)) above the proposed optimal area per bed.

Rapid developments in medical technologies put additional requirements for hospital building architectural construction. Modern standards foresee flexibility redesigning hospital premises to enable optimal function workflow. Therefore, construction type of the existing buildings plays an important role in evaluating perspectivity of the building for further high-tech medical use. From this point of view IVCH, ETCH, Kuressaare, Raplamaa, Hiiumaa and Järvamaa hospitals can have problems in redesigning some or all their existing buildings to be suitable for acute medical services. However, these buildings can be still refurbished for better patient accommodation (1-2 patient rooms with bathroom) or doctors' offices for outpatient services.

During the last 30 years, over 52% of the total floor area in hospitals has newly constructed or underwent major renovation compared to 42% in Group 2 general hospitals. None of capital renewals has been accomplished in SHE, Põlva, Hiiumaa, Jõgeva hospitals and 17% in Läänemaa.

Looking in combination the indicators of “*share of new/fully renovated area*” and “*10 years/5 years average reinvestment rate of buildings*” it can be concluded that despite of some improvements and renovations under the government supported nursing care facilities development program 2007-2013, buildings of Jõgeva, Läänemaa, Põlva, Hiiumaa and South Estonia hospitals are still in need of major renewals. However, the financial status of these hospitals, except Läänemaa, is not in line to enable additional major investments.

The existing regulation¹⁰ foresees general hospitals to provide 24h services at least in 6 specialties: emergency medicine, internal medicine, general surgery, anaesthesiology, laboratory medicine and radiology. EHIF has a special reimbursement scheme (preparedness fee) to enable hospitals to cover human resource costs related to the set requirements. However, the actual optimal demand for 24hrs emergency capacity seems to be questionable for most of Group 2 general hospitals having less than 20 emergency referrals on average per day. The preparedness fee is meant to cover the costs occurring after normal business hours, weekends and national holidays. Assuming that approximately 40% of patients are referring to ED-s outside business hours, the cost per patient to EHIF in Läänemaa, Põlva, Raplamaa and Valga hospitals will range from 203 to 290 EUR/case, which is 3-4 fold of an average outpatient case cost (67EUR) in general hospitals. The preparedness fee forms also a notable share (13-18%)

¹⁰ <https://www.riigiteataja.ee/akt/793970?leiaKehtiv>

in Group 2 hospitals' in-patient revenue, except Jõgeva (7%). In General hospital Group1 the share is under 10% for all hospitals and less than 6% for central and less than 4% in regional hospitals.

The overall financial sustainability is under pressure in a number of general hospitals in both Group1 and Group 2 hospitals if measured in 3 years average EBITDA share (%) of total revenue without governmental grants. The problem is more common in Group 2 hospitals, except in Läänemaa and Rapla hospitals after networking with NEMC, but also for Narva Hospital and SHE in Group 1. In 2018, several Group 1 hospitals have also exceeded their lending capacity (Debt to EBITDA' ratio over 6%). Here also the networking with NEMC is showing positive influence for Hiiumaa and Läänemaa hospitals.

Table 1 Summary heatmap table of selected indicators of HNDP hospitals

Indicator	Doctors' FTE/Head Ratio	Nurse /Doctors Ratio FTE	Doctors median age (yrs)	CA population justified by % services used in home county	Bed occupancy 2018 (%)	Share (%) of 1-2 bed patient rooms	Share (%) of patients rooms with WC&shower	Gross area sqm per bed	Share (%) of new/fully renovated area (1990-2020)	Share (%) of load-bearing post and beam structure or mixed construction type of buildings	Avoidable hospitalizations OECD HCQ/WHO/ EHMP/2040 mapping team (2019)	Avoidable hospitalizations OECD HCQ/WHO/ EHMP/2040 mapping team (2019)	EMO cases per day (2019)	Preparedness fee cost/ EMO case serviced after usual business hours (8-18) (2019) 40% of all EMO cases	3 yrs average EBITDA* % to revenue* (2016-2018)	5 years Average Reinvestment Rate (2014-2018) of buildings	10 years Average Reinvestment Rate (2009-2018) of buildings	Debt/EBITA* (2018)	% of preparedness fee of inpatient revenue (2019)
Threshold 1	0,8					90	100		50	80	15%	15%	30	120,73	4%	10%	10%	5%	10%
Threshold 2											20%	20%			10%	25%	25%	6%	
Regional Hospitals (average)								EHMP 2015 Standard	55	86	13%	8%		Average cost per an outpatient case for this hospital group					
Threshold 1		1,74	40	NA	80			120						120,73					
Threshold 2		2	50					130											
TUC	0,81	1,75	42	134 919	76	81	84	156	59	87	10%	8%	116	151,52	10%	12%	7%	2,6%	2%
NEMC	0,83	1,95	40	101 282	80	47	58	150	49	81	18%	9%	203	66,60	8%	12%	14%	6,0%	2%
TCH	0,77	1,88	54	50 641	71	90	100	233	63	100	NA	8%	133	40,66	5%	12%	7%	2,7%	4%
Central Hospitals								EHMP 2015 Standard	52	73	16%	9%		Average cost per an outpatient case for this hospital group					
Threshold 1		1,8	45	40 000	80			110						80,92					
Threshold 2		2,6	55					120											
ETOH	0,81	1,87	43	140 669	82	73	58	137	20	45	14%	6%	208	45,50	6%	20%	19%	4,10%	3%
WTC	0,83	1,9	48,5	101 282	80	89	77	129	51	100	23%	9%	52	184,02	10%	5%	10%	1%	4%
Pärnu Hospital	0,83	2,42	49,5	68 948	73	79	100	117	100	89	15%	11%	79	136,91	7%	1%	7%	5,50%	7%
IVCH	0,91	2,52	52,5	40 318	82	96	69	127	57	56	17%	16%	81	116,84	8%	3%	6%	1,80%	6%
General Hospitals Group 1								EHMP 2015 Standard	51	77	20%	15%		Average cost per an outpatient case for this hospital group					
Threshold 1		2,5	45	20 000	80			90		100				67,43					
Threshold 2		3	55					100											
Kuressaare Hospital	0,83	2,18	49	24 481	70	72	90	113	100	0	20%	12%	34	119,30	6%	13%	29%	NEG	9%
Narva Hospital	0,9	2,58	61	20 676	71	58	34	134	73	100	24%	21%	54	75,11	3%	3%	11%	2,30%	5%
Rakvere Hospital	0,8	2,69	45	34 729	55	79	58	104	81	93	13%	12%	47	86,30	6%	2%	16%	3%	8%
South-Estonian Hospital (SEH)	0,83	3,18	46	19 832	80	75	71	99	0	100	18%	16%	38	106,74	3%	4%	8%	4,80%	9%
Viljandi Hospital	0,85	2,26	48,5	30 928	77	70	39	76	18	76	21%	16%	39	138,67	11%	2%	8%	1%	8%
General Hospitals Group 2								EHMP 2015 Standard	42		26%	21%		Average cost per an outpatient case for this hospital group					
Threshold 1		2,5	45	20 000	85			90						66,97					
Threshold 2		3	55					100											
Järvamaa Hospital	0,68	1,52	56	16 897	55	63	86	87	89	0	12%	11%	33	122,91	3%	0%	7%	7,20%	13%
Hiiumaa Hospital	0,62	2,53	59	4 192	86	100	96	77	0	0	16%	15%	9	2126,00	1%	1%	15%	2,60%	50%
Jõgeva Hospital	0,75	2,25	62	12 230	45	50	16	118	0	100	32%	28%	8	169,00	2%	2%	12%	7,50%	7%
Läänemaa Hospital	0,72	2,28	55	12 880	54	80	7	69	17	100	30%	21%	20	202,80	5%	3%	10%	4,10%	14%
Põlva Hospital	0,72	1,68	53,5	9 859	67	46	36	131	0	100	17%	19%	14	289,72	1%	21%	19%	NEG	14%
Raplamaa Hospital	0,66	1,79	51	14 311	81	43	0	75	100	0	36%	28%	19	213,48	4%	3%	12%	7,70%	18%
Valga Hospital	0,71	2,65	51,5	14 384	62	67	89	188	100	100	32%	31%	17	238,59	2%	2%	14%	9,70%	15%
Haapsalu Neurehabilitation Centre	0,87	3,99	64,5	12 880	84	73	98	73	100	100	NA	NA	0	0,00	12%	2%	7%	0,70%	0%

Explanations:

1. The values/indicators are weighed against AARC expert team set thresholds either at general or hospital type level.
2. The colours are connected with the thresholds as follows: "orange" - less favourite declination from optimal, "green" – optimal, "blue" – above (more positive) optimal.
3. Haapsalu Neurehabilitation Centre is grouped to general hospital Group 2 but actually as a specialised institution has totally different profile and not considered to be evaluated against the same thresholds.

2. Report Context¹¹

2.1 General Context

Estonia has been praised by international organizations like the World Bank and WHO for its successful health care reforms bringing the country from a Soviet inefficient health system to one of the most cost-efficient health care systems by early 2000s. Complex reforms were started in health care right after regaining independence, starting with introducing social health insurance system, reforming public health system and early steps in optimization of hospital system by mid 90s last century. While in the first stage of hospital reform the number of hospitals and hospital beds had been reduced considerably. Between 1991 and 1995, over one third of the 18000 beds were closed, both in small and large hospitals. After establishing a hospital licensing system in 1994, the number of hospitals and hospital beds had continued to decrease because small hospitals (which in practice provided long-term care) lost their acute care licenses, were turned into nursing homes or closed.

For implementation of the health care reform, the Estonian Health Project 2000 (Eesti Tervishoiuprojekt 2000) was launched by the Ministry of Social Affairs with financial support of the World Bank in 1995¹² that enabled to continue with changes in Primary Health Care by introducing family medicine system with capitation reimbursement and major reforms in hospital sector. For the latter a consultancy was procured to develop the Estonian Hospital Master Plan 2015. The plan proposed to optimize the number of acute care hospitals from 27 to 13 and the number of acute beds from 8200 to 3100 by decreasing substantially the average length of stay (ALOS) with a significant part of the care to be transferred to an outpatient setting. The optimization process was a prerequisite to achieve major investments in order to improve hospital care standards and replace Soviet time infrastructure. The plan also advised to strengthen medical care for elderly because of an obvious trend for population aging and foresee a need for app. 6000–7000 beds in nursing homes by 2015¹³. In health care financing it was advised that 17 local sickness funds with 17 catchment areas are highly inefficient way to govern the system and in order to facilitate the hospital network optimization, a consolidation of reimbursement system is vital¹⁴.

The success to implement the plan was extraordinary and noticed at the global arena. To implement the proposed HMP 2015 the government approved in 2003 the Hospital Network Development Plan (HNDP) as the key tool in hospital governance and specialized medical care delivery and by the second half of the last decade major part of the recommendations were enacted, mostly through consolidations and infrastructure optimization in Tartu and Tallinn supported by changes in legislation stipulating institutional autonomy for health care providers, clear purchaser-provider split and bringing all hospitals under private law. With concentrating the public health insurance system, service contracting capacity of public health insurance system was substantially strengthened with strategic purchasing principles introduced. Major investments into hospital infrastructure, mostly in regional and central hospitals, were enabled by increased efficiency of the system supported by EU financing from the government.

¹¹ Text from Technical Proposal of Person-centred integrated hospital master plan in Estonia – SRSS/SC2019/140

¹² IESE case study: The learning process in the Health Care Reform in Estonia

¹³ “The number of beds for long-term care or in nursing homes in 2015 perspective is difficult to estimate today since it also depends on the progress of public health and on the ongoing development in social care. We have however estimated 6000-7000 beds in nursing homes in the year of 2015.” Estonia Hospital Master Plan 2015, Executive Summary, page 7

¹⁴ Estonian Hospital Master Plan 2015, Scandinavian Care Consultants AB and SWECO International AB, 2000

Despite substantial success in health care reforms that have been outstanding compared to most of the countries in transition, there were some deficiencies in the process that by now manifest as setbacks in the system:

- (1) Due to the lack of political support no explicit decision was made on including full amount capital costs component into specialized health care pricing and the system where some service providers were getting assets from the government without any costs of financing, is creating unfair market conditions and perverse motivation. As the consequence, service prices cover mainly costs for everyday maintenance and providers are facing challenges to save for major investments, such as new expensive technologies and restructuring of infrastructure.
- (2) There is not enough motivation and support in PHC system for family doctors to ensure their full position to act as an agent for the patient. In one hand family doctors do not have the responsibility to secure availability for the patients 24/7. This is causing inappropriate demand for acute hospitals' ER services. In the other hand, the situation where family doctors have to overhand their practice at retirement to the Health Board without any financial award does not facilitate for long term motivation in developing their practice. In addition, there is room for improved communication between PHC and specialized care system as well with social care system.
- (3) Although, in the case of regional and central hospitals the HMP2015 has been almost fully implemented, for general and local hospitals there is still some way to go. The total number of general hospitals delivering acute services is still suboptimal. The current total number of acute hospitals is 19, while the HMP suggested to have 13 hospitals by 2015.

In addition to the issues above, provision of cost-efficient and equitable acute hospital services is aggravated by decreasing rural population and shortage of specialists willing to work in general hospitals, while in general the health care system's ability to secure person-centred longitudinal care is growingly affected by the trends characteristic for economically developed world, as aging and increasing prevalence of chronic diseases are more and more evident also in Estonia.

To address these the problems, in 2014 the MoSA started a process to create networks between regional and county hospitals, with the aim to ensure accessibility to essential services and good-quality healthcare, and to rationalize the use of resources and investments at the county level. By early 2019, nine general hospitals participated in hospital networks, and this number is expected to increase.

However, more comprehensive strategic planning is needed to assist the country to face inevitable societal trends and support the national authorities in enhancing their capacity to formulate, develop and implement reform policies and strategies in pursuing an integrated approach ensuring consistency between goals and means across sectors.

2.2 Purpose of the Technical Support Program

This report forms Deliverable A of the DG REFORM project '**Person-centred integrated hospital master plan in Estonia**' The expected outcomes of the project are:

Outcome 1: A comprehensive map of the current hospital system is prepared and shows the supply of healthcare in different specialties, the distribution of physical and human resources, the financial flows, and the mechanisms of governance and information sharing.

Outcome 2: A sound analytical prediction model is developed and provides evidence-based estimates of the population needs and the supply of health workforce and healthcare services and infrastructures.

Outcome 3: A proposal for a hospital master plan is delivered to Estonian authorities to support them in defining and adopting sound reforms in the hospital sector in the mid-term.

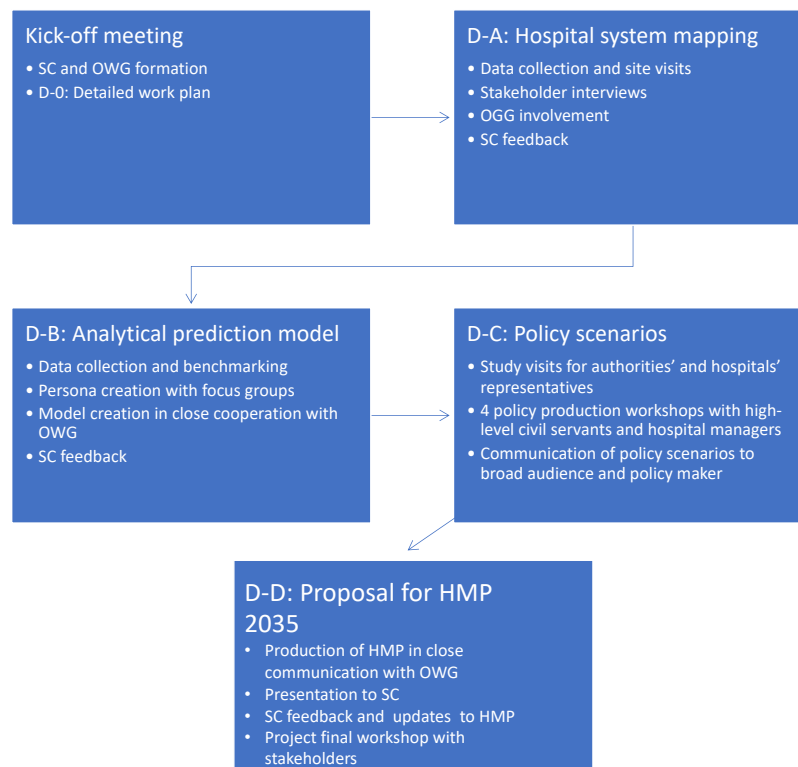
While the assignment is based in main element on classic hospital master planning standard, it should not be restricted to just in-patient care alone, but rather take a more broad and comprehensive scope on specialized health care delivery system, in-patient and out-patient, and its smooth integration with prevention, PHC, rehabilitation and long-term and social care. However, taking into account the time and financial resources allocated for the assignment, it is possible to address only limited scope of the health care system elements listed above and concentrate on specialized care delivery, while paying some general attention to the related elements important in coordinated treatment and satisfaction of patients' expectations throughout their path in the system.

Therefore, our experienced team's approach is to be as specific as possible in mapping the current specialized health care system and future needs for services to develop strategic scenarios with the client and stakeholders, while at the same time also give recommendations and input for future development needs in health and social care sectors pertinent to the patients' health care journey and for chronic diseases in particular, in order support the vision of the National Health Plan 2020–2030 in ensuring high quality and accessible healthcare services, which are integrated with social services to support increasing quality of life for patients with chronic illnesses and reduce premature mortality.

3. Project structure

The project is structured to have four phases, with a Deliverable presented to the Steering Committee at the end of each phase: three interim reports and final report at the end of the project period (Figure 1). The MoSA has established an operational working group (OWG) to work closely with the contractor to deliver all planned outputs. The project is due to be completed by Dec 31, 2021.

Figure 1 Project structure



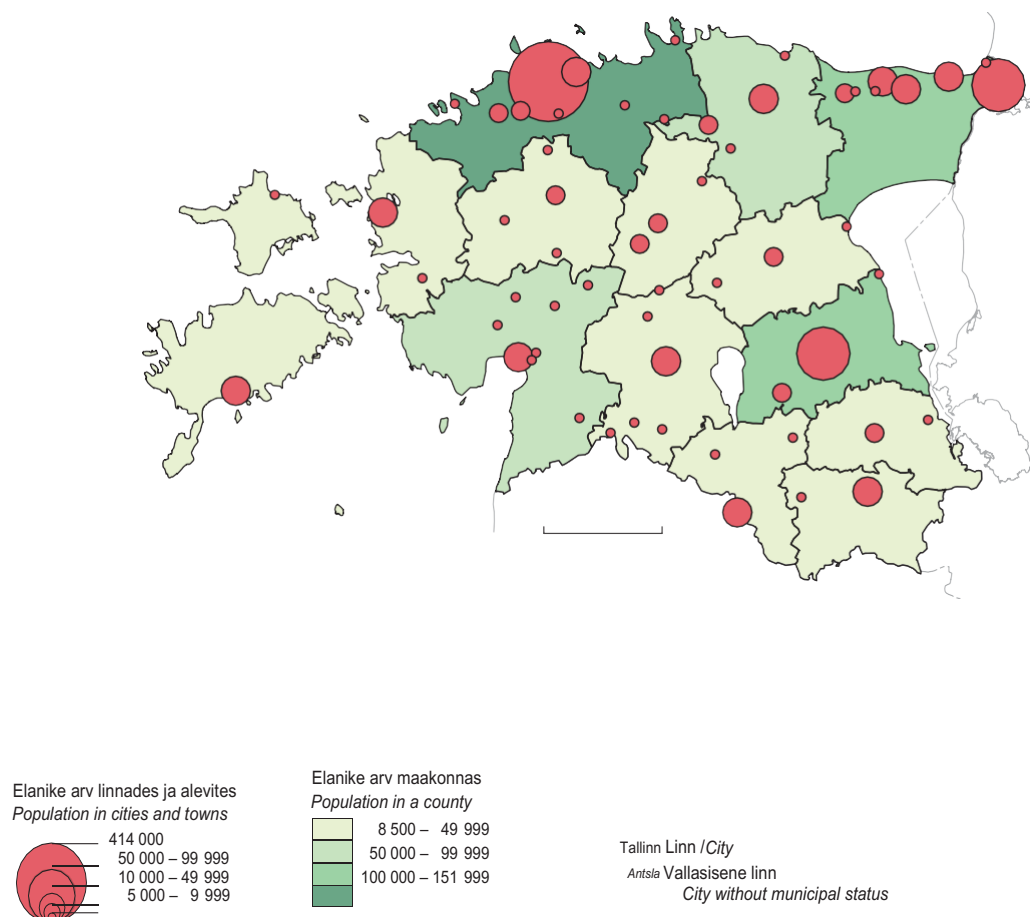
4. Overview of Deliverable A and approach to mapping the current hospital system.

The RfS of the assignment stipulates Outcome 1 of the project as a comprehensive mapping of the current hospital system that shows the supply of healthcare in different specialties, the distribution of physical and human resources, the financial flows, and the mechanisms of governance and information sharing.

In mapping the hospital system in Estonia, we have analysed the supply of healthcare services in different specialties and looking to physical and human resources deployed in hospital system, hospital financial flows, and assessing the governance and information sharing mechanisms. For the assessment, our team used different information sources, including questionnaires and interviews with stakeholders, reports available from donors, national and international organizations, and analyses of health and financial data. The main national data sources have been EHIF, NIHD and the Health Board. For international benchmarking, information by the World Bank, Eurostat, OECD, and WHO has been used.

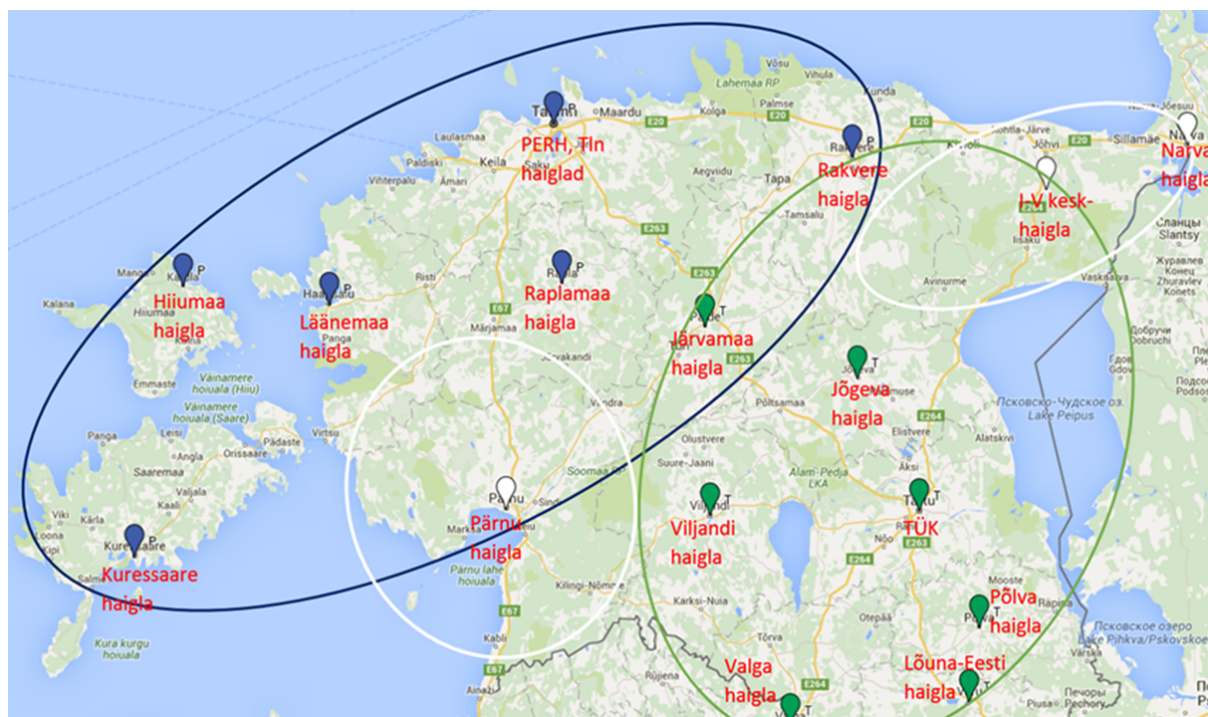
As of Jan 1, 2020 the total population of the country was 1 328 976. The population decreased by 241 623 people in the last 30 years i.e. *ca* 15%, while the number of 65 and older has increased by 84 683 people. The population of Harju County has practically not experienced decline and Tartu population has decreased by *ca* 6% only, other Estonian counties have lost 14 to 39% of their population.

Figure 2 Population of counties and urban settlements, 1 January 2020 Source: Statistics Estonia



Estonia is divided into 15 counties. Geographically there is at least one HNBP hospital in each county and it is meant to serve mainly the local habitants. In the capital Tallinn there are two central (WTCH, ETCH) and two regional hospitals (NEHC and TCH). Tallinn is the administrative centre for West and North Estonia patients. Hiiumaa, Läänemaa and Raplamaa hospitals are formally networked and consolidated with NEHC. TUH is the university hospital located in Tartu. It is a tertiary care centre for Southern Estonia and partly for North-East Estonia. Valga, South-Estonia and Põlva hospitals are formally networked and consolidated with TUH. North-East population patients are served mostly by IVCH and Narva hospital and both hospitals collaborate with TUH. The fourth central hospital is located in Pärnu to serve primarily Pärnu County population.

Figure 3 HNBP hospitals locations and natural catchment areas for regional and central hospitals that determine collaboration between hospitals



To facilitate and structure the mapping exercise the task team has grouped HNBP and 3 private hospitals using the following criteria: catchment area size, service characteristics and turnover. The three private hospitals were selected in agreement with the OWG.

Regional hospitals

1. Tartu University Hospital (TUH)
2. North Estonian Medical Centre (NEMC)
3. Tallinn Children's Hospital (TCH)

Central hospitals

1. Pärnu Hospital
2. Ida-Viru Central Hospital (IVCH)
3. East Tallinn Central Hospital (ETCH)
4. West Tallinn Central Hospital (WTCH)

General hospitals Group 1

1. Kuressaare Hospital
2. Narva Hospital
3. Rakvere Hospital
4. South-Estonian Hospital (SEH)
5. Viljandi Hospital

General hospitals Group 2 (including one local hospital)

1. Järvamaa Hospital
2. Hiiu Hospital

3. Jõgeva Hospital¹⁵
4. Läänemaa Hospital
5. Põlva Hospital
6. Raplamaa Hospital
7. Valga Hospital
8. Haapsalu Neurological Rehabilitation Centre (HNRC)
- 9.

Other Non-HNDP hospitals

1. Elva Hospital
2. Fertilitas
3. Hospital of Reconstructive Surgery

4.1 Mapping of human resources in hospitals.

Detailed methodology and approach

Human resources for health care are identified as one of the core building blocks of a health system. According to the RfS, the current task is focused to map human resources in hospitals, leaving aside primary health care, other outpatient service providers and independent rehabilitation service providers. Together with the OWG, it was decided that mapping of human resources covers all HNDP hospitals, plus three private hospitals – Fertilitas, Elva Hospital and Hospital of Reconstructive Surgery.

The main HR data sources are the databases of the National Institute for Health Development and the Health Board. Since 2013, the NIHD started to collect health care personnel data on individual basis. All healthcare providers submit annual statistical reports to NIHD about the health care human resources employed in their organization. These web-based reports reflect all employee relations based on statistics from the month of November, and provide comprehensive information about all working staff.

The Health Board is responsible to keep the Estonian National Registry of Health Care Professionals Register Workers updated, both for physicians and nurses. However, the registry covers all doctors and nurses who have license to work in their specialty area only, and does not reflect specifically the information of personnel employed in hospitals. Because of that, the choice was made to only use the HR related data in hospitals from NIHD for mapping.

Classification of occupations of the health care system ISCO-08¹⁶ by ILO and Eurostat was used, as NIHD is also responsible for reporting data for international statistics. Together with the OWG, the scope of medical profiles and the list and groups of occupations for nurses and technical personnel were agreed.

The information collection was organized retrospectively starting from 2015 and onward till 2019 inclusively. The current report provides visualization of key information and reflection on main changes that can be observed in Tableau visual graphics. More detailed information can be learned in Annex 1 “Mapping of medical workforce in hospitals“.

¹⁵ Jõgeva Hospital is formally a local hospital but is grouped into general hospitals Group 2 since its service area, annual revenue and service provision characteristics are similar to other hospitals in this group.

¹⁶ International Standard Classification of Occupations, <https://www.ilo.org/public/english/bureau/stat/isco/isco08/>, used in June 2020

For international benchmarking the OECD database was used, as data for 2018 is already available for most countries on the public database, the range of countries projected is wider, covering almost all EU countries and of course OECD countries. Published data is compiled by OECD, Eurostat and WHO-EURO Joint Questionnaire on non-monetary Health statistics, securing the usage of the same methodology for all countries and international organisations¹⁷.

Mapping of HR in hospitals is represented in two categories, Full-Time Equivalent (FTE) to express the total number of full time job positions created in given hospital to perform the volume of planned work, and the headcount to illustrate how many physical persons are employed to fill the FTE. Given approach lays as a basis also for most common reporting principles and collecting statistics by international organizations groups, like physicians and nurses, indicating the status and trend of employment relations. It can be said, that the lower is the ratio of FTE/headcount, the higher is an indication of the part-time employment. Higher part-time employment is an indicator that medical professionals work for several health care employers. We are not in a position to give a judgement whether lowering ratio of FTE/headcount is good or bad, we just refer to an indicator which in combination with other developments, including migration of population from rural area and small cities, concentration of high-tech medical services and infrastructure, networking of hospitals, and others, can be used in the following phases of the project to project the future trends.

In addition to data collection from the described data bases, additional background information was collected during the visits to the hospitals, where management boards and staff focus-groups were interviewed.

4.1.1 Medical workforce in hospitals

4.1.1.1 Mapping of doctors in hospitals 2015-2019.

The following is a summary information on mapping of physicians in Estonian hospitals and monitoring potential trends, that can be observed over the last five-year timeline.

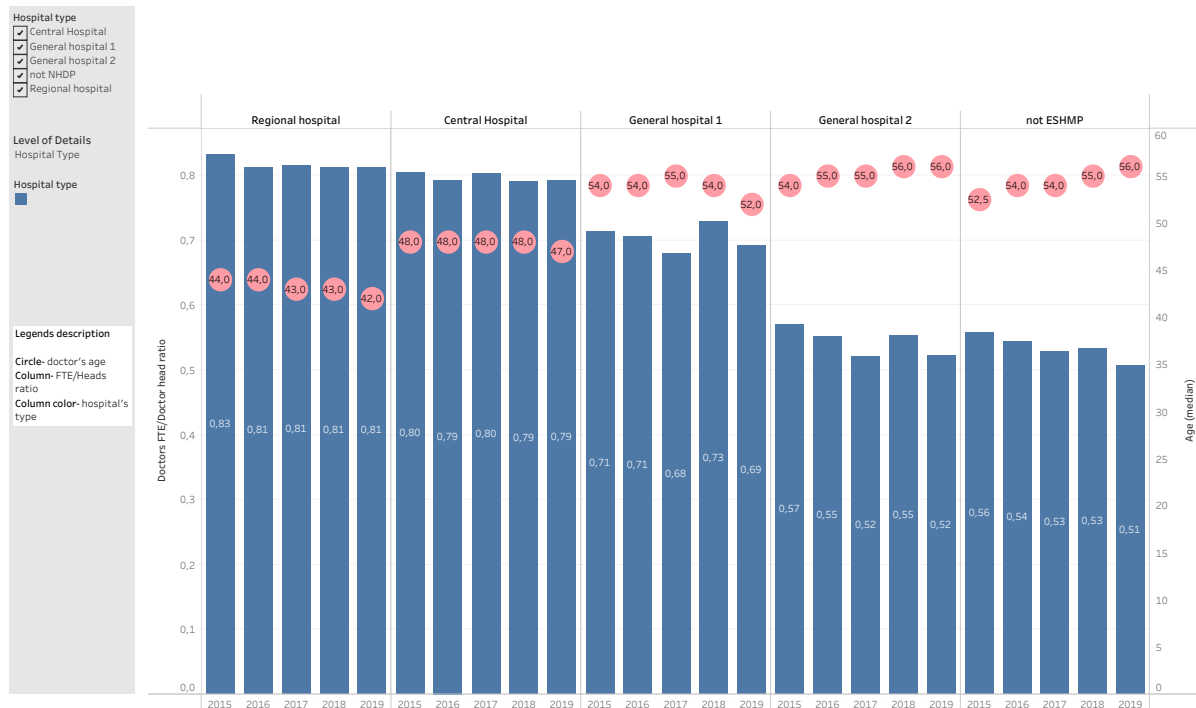
The total number of reported physicians Full-Time Equivalent (FTE) in all hospitals together demonstrates a slight increase of 2,4%, from 2817 in 2015 to 2885 in 2019. At the same time, the total number of doctors as physical persons (Heads) in hospitals has increased twice as fast from 3204 in 2015 to 3380 in 2019, what makes the increase of 5,5%. The increase of both, FTE-s and Heads, takes place mostly in regional and central hospitals, and also in few general hospitals from the Group 1. In the group of smaller general hospitals (Group 2), the trend indicates steady decline, whereas the total number of FTE-s for the group has decreased by 11% and the number of doctors (heads) by app. 3%.

The FTE/Head ratio for all hospitals has decreased from 0,88 to 0,85, indicating to a trend a doctor to have increasing number of employers, including private outpatient clinics. The FTE/Head ratio is more stable in bigger hospitals and is declining mostly in Group 2 of general hospitals and in private hospitals.

¹⁷ Joint Data Collection on Non-Monetary Health Care Statistics - Joint Questionnaire 2020, Guidelines for Completing the OECD/Eurostat/WHO-Europe Questionnaire 2020 <https://www.oecd.org/statistics/data-collection/Health%20Data%20-%20Guidelines%202.pdf>

Figure 4 Medical doctor FTE/Head ratio and median age in Estonian hospitals

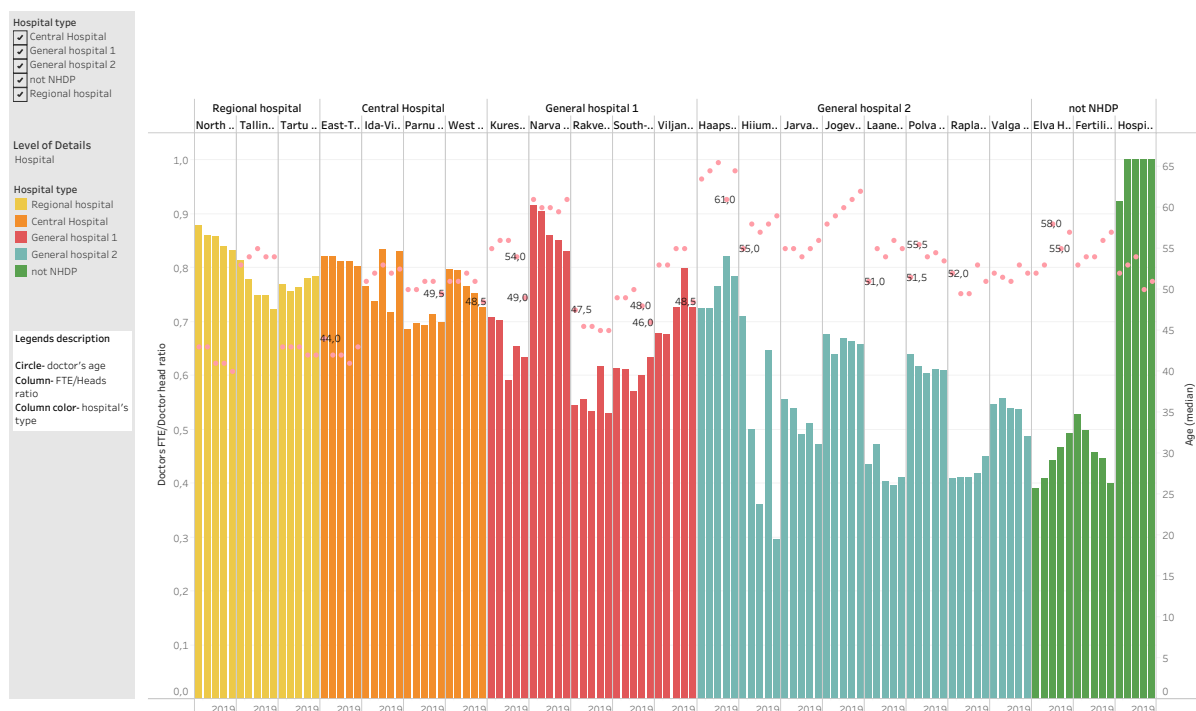
1. Medical doctor FTE/Head ratio and median age in Estonian hospitals. NIHD, 2020



The same picture is in comparing single hospitals, indicating bigger differences between the hospitals and clear outliers can be noticed among general hospitals in Group 2. We can notice the increase of average age of doctors in these hospitals and lowering in FTE/Head ratio, what clearly indicates issues with permanent contracting of younger doctors.

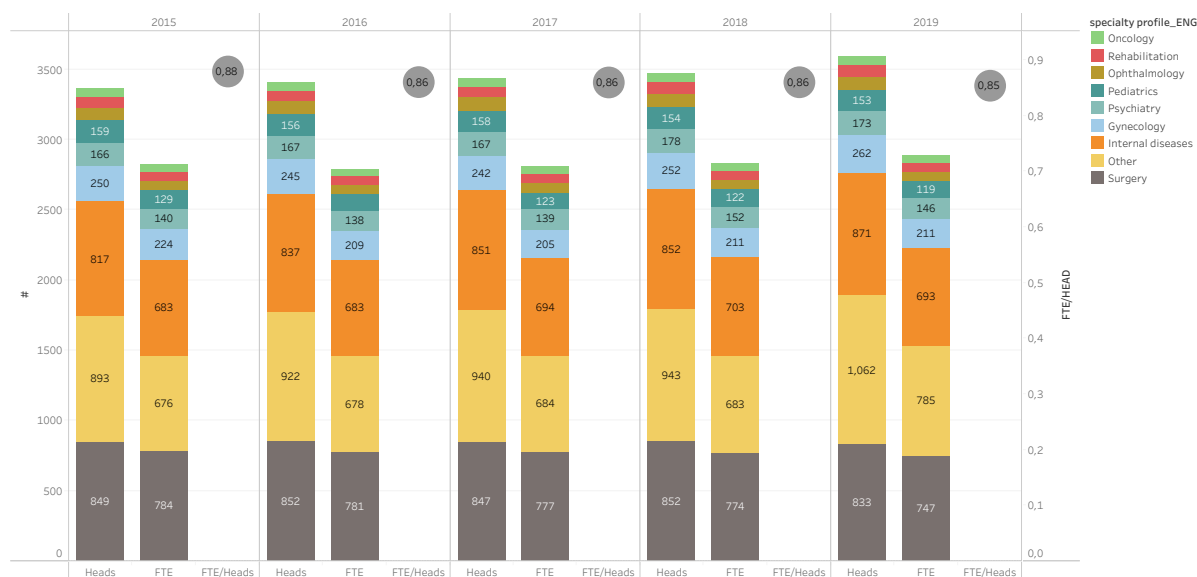
Figure 5 Doctors FTE/Head ratio and average age by hospital

1. Medical doctor FTE/Head ratio and median age in Estonian hospitals. NIHD, 2020



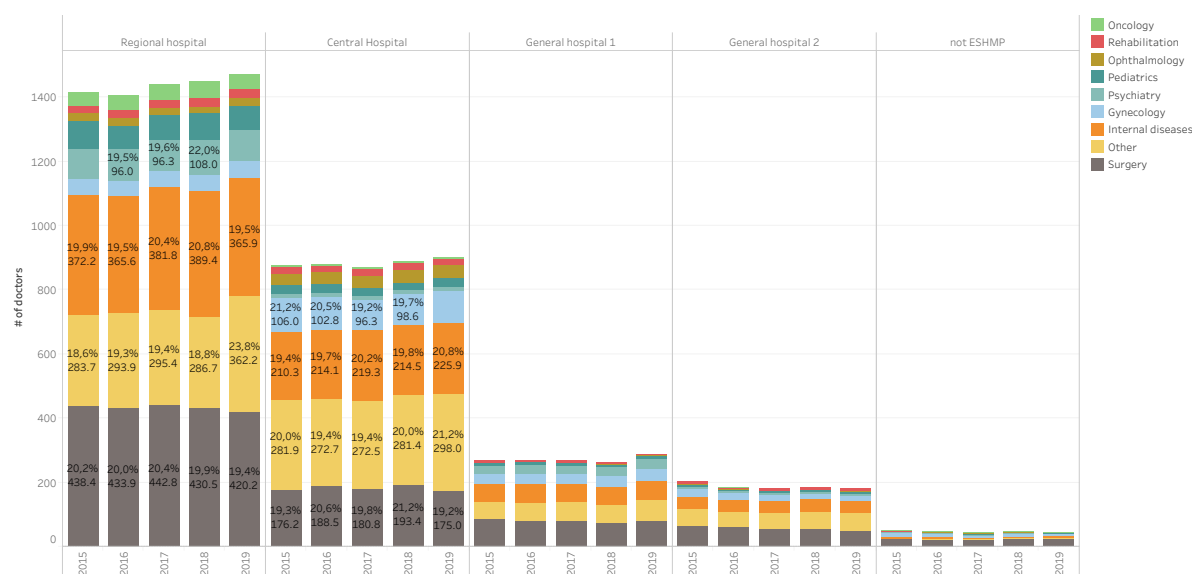
The number of physicians and FTE-s in main medical profiles are rather stable over the last five years. It is difficult to say whether a minimal decrease of surgeons and increase of doctors in internal medicine indicate a trend. However, most significant and continuous increase has been in number of “other” physicians category, nearly 19% in head count and 16% in FTE.

Figure 6 Physicians in hospitals in total by occupation



If looking to distribution of physicians (Heads) in specialty areas in different types of the hospitals, the fastest growing category of doctors is “other“, being represented primarily by doctors without specialization. The rest of the categories are more stable, with little decline among surgeons in regional hospitals and with increase of doctors in internal diseases in central and general hospitals in Group 1.

Figure 7 Physicians (Heads) in specialty areas by type of hospital.

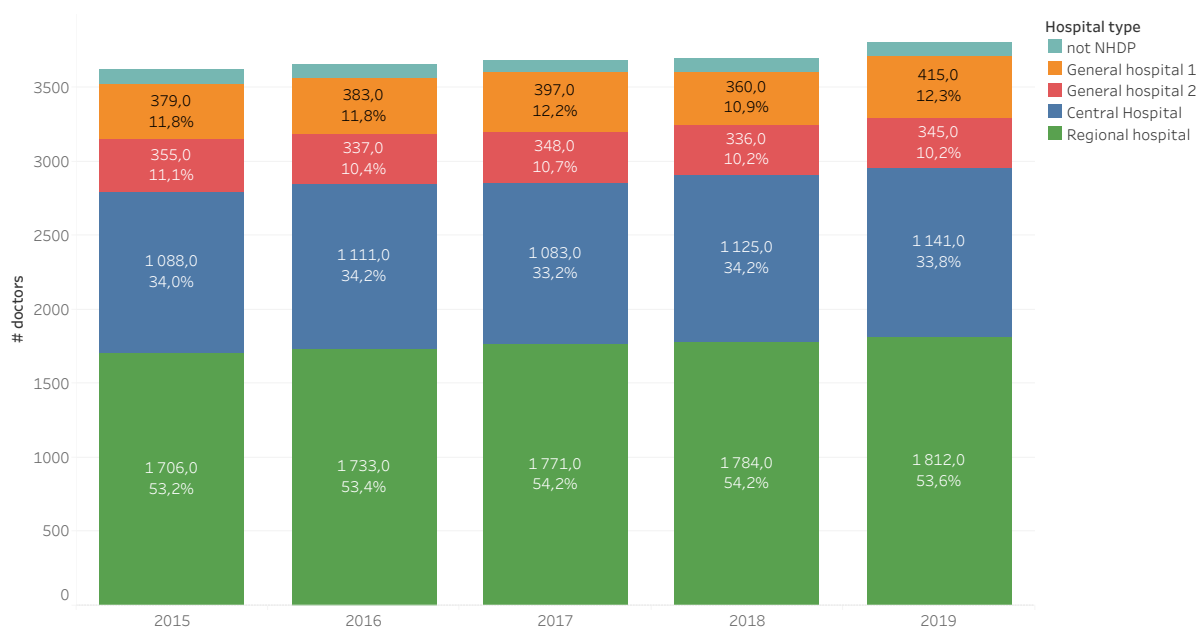


The majority of physicians, 82 % of overall number of doctors in Estonia, are working in regional and central hospitals with no change of the share over the last five years, while the number of doctors headcount increasing by 3%. This is mainly due to the influx of new

graduates from the Tartu University. A little more than half of all physicians (51%) are working in two regional hospitals and 31% in central hospitals

In general hospitals we can notice trends in the opposite directions, whereas the overall number of physicians in Group 1 increasing and in Group 2 decreasing. During our visits to the sample hospitals we collected additional information on this. Management boards of general hospitals explained that young physicians are not motivated to work in smaller locations. The number of physicians working in general hospitals as the main employer is decreasing, however, the head count being stable due to increasing number of physicians from regional and central hospitals contracted part time. There are cases of 2,0 FTE contracted by five or six visiting physicians from higher level hospitals. More detailed data is available in tables in Annex 1.

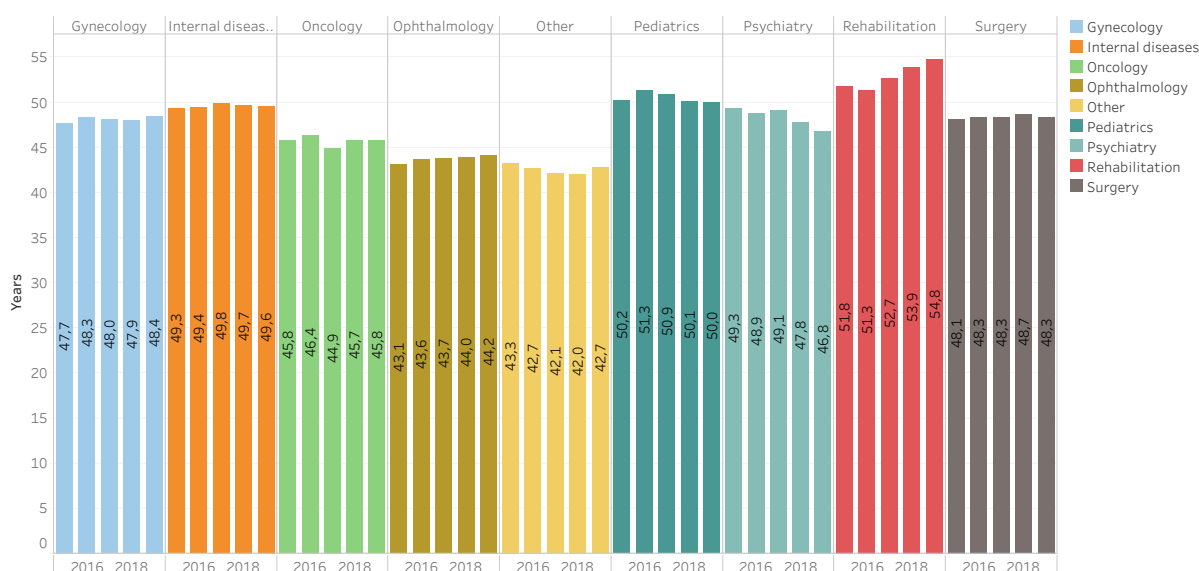
Figure 8 Distribution of doctors based on the type of hospitals



Distribution of physicians by sex has been stable with less than 1% fluctuation over the last five years. Almost 70% of all doctors in hospitals are female, while the majority of specialists in surgical professions and orthopaedics are men.

The median age of all doctors working in hospitals was 47,0 years in 2019, compared to 47,2 in 2015. The median age in most specialty profiles has been rather stable or decreasing in some specialties, like in psychiatry and paediatrics. The youngest doctors are working in oncology and ophthalmology. The group “other” contains many young doctors without specialty who just started their path to get a specialty. We can see that a median age of rehabilitation doctors’ group gets older year by year, which obviously is due to lack of new entries into the specialty. The median age of rehabilitation doctors is close to 55 years already, which is worrying signal considering potential increase of demand for the particular service in the future due to population aging.

Figure 9 Distribution of doctors by average age in specialty areas 2015-2019



According to Figure 2 in above, the median age of doctors is the lowest in regional (46,3 yrs) and central hospitals (46,6 yrs). The median age of doctors in general hospitals Group 1 is stable, but slightly higher than in regional and central hospitals (49,4 in 2019). The situation is different in general hospitals Group 2 with the trend to increase from 48,6 to 50,1 years in 2015-2019. According to general hospitals managers, the average age of full-time staff is even higher and increasing rapidly.

4.1.1.2 Mapping of nurses in hospitals 2015-2019.

The following section covers mapping of nurses in four main occupation categories as agreed with OWG — general nurses, midwives, specialised nurses, and category “other” that includes dental nurses, home nurses and heads of nursing. The current reporting practice on nurses working in hospitals is coordinated by the NIHD and follows the ISCO classification. The methodology foresees categorisation of nurses by the medical profile or the department they work. In the most cases nurses in the departments do not have formal specialisation in the profile, rather they have a general nurse formal qualification and have got trained at site. According to the ISCO classification the following categories of nurses are reported – anaesthesia-intensive care nurse, operating nurse, psychiatric nurse, pulmonology nurse and rehabilitation nurse.¹⁸

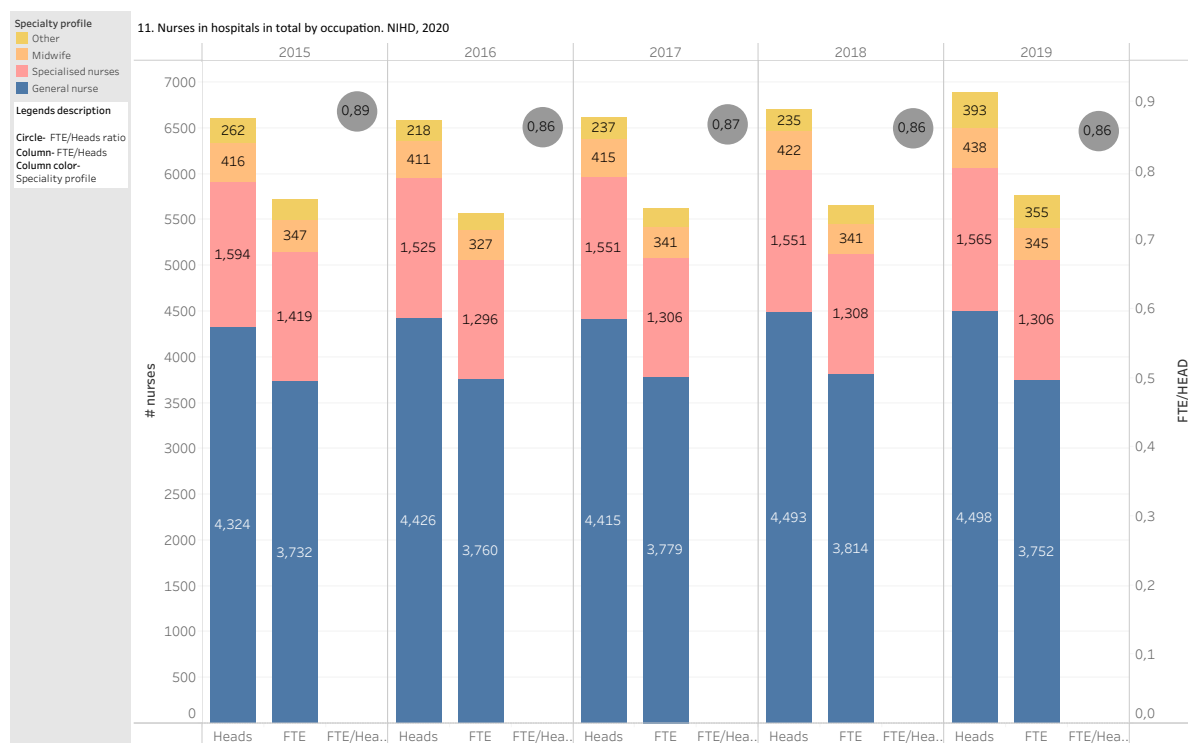
In 2019, there was 5758 FTE-s for nurses in all hospitals, increasing by 0,7% since 2015. At the same time the number of physical persons (Heads) in nursing has increased 4,5% to 6894 in 2019. Considering the general shortage of nurses in healthcare sector in Estonia¹⁹, the minimal increase in FTE-s indicates that almost no new nursing positions have been added in

¹⁸ According to the official classification in Estonia an advanced practice nurse (APN) is a nurse who has completed the specialised nursing curriculum or one nursing care speciality on the Master's programme in health sciences, and has obtained more advanced clinical competence and decision making skills in the acquired speciality, as well as the preparedness to work independently and/or in the interdisciplinary team and to lead the research and development activity. There are four categories of APN-s by the MoSA decree <https://www.riigiteataja.ee/akt/123082019013>: health nurse, clinical nurse, intensive care nurse and mental health nurse. This classification, however, is not compatible with the ISCO classification and doesn't allow international comparison as the OECD is using the latter classification.

¹⁹ https://oska.kutsekoda.ee/wp-content/uploads/2016/04/tervishoiu_uuringu_terviktekst.pdf “Tulevikuvaade tööjõu- ja oskuste vajadusele: tervishoid”, SA Kutsekoda, Tallinn, 2017 lk50-52

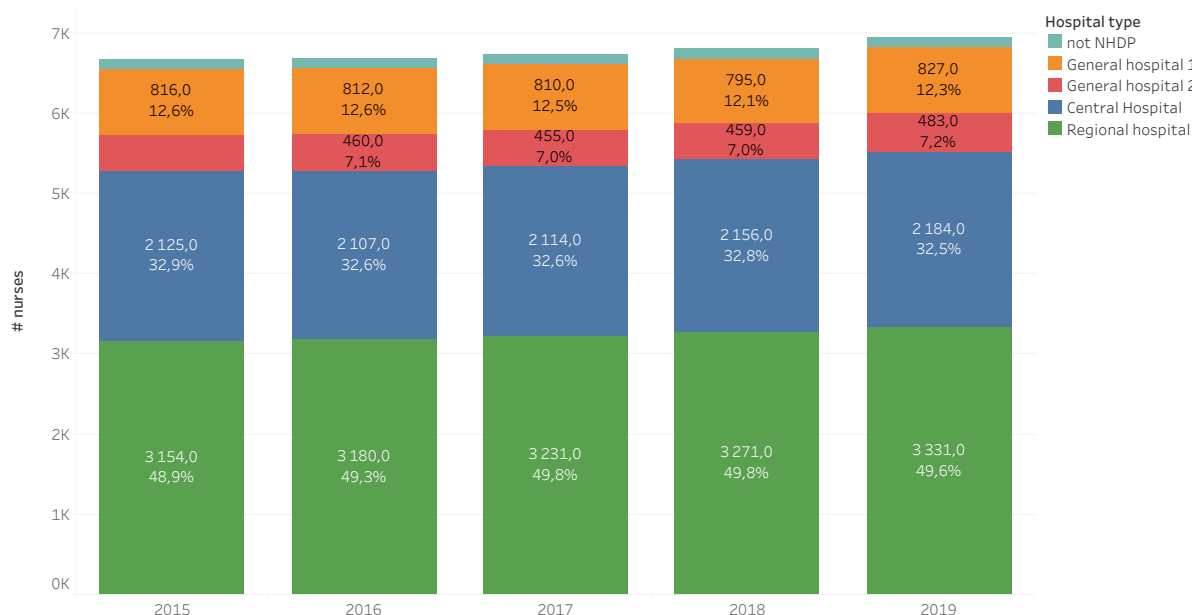
hospitals between 2015-2019. The little change in FTE/Head ratio, from 0,89 to 0,86, indicates that also nurses are increasingly working for more employers, although lesser extent than doctors.

Figure 10 Nurses in hospitals in total by occupation



The majority (80%) of hospital nurses are working in regional and central hospitals. There have been only minor fluctuations over the last five-year period with a slight constant increase in regional hospitals.

Figure 11 Distribution of nurses (Heads) by the type of hospitals



In the recent years, nursing services, including home-nursing, have been increasingly developed in hospitals, however, without noticeable increase of nursing FTE-s and/or head count. A detailed description of distribution of nurses (FTE-s and head count) between the hospitals and is provided in Annex 1 sheet 10. The changes within the hospitals are minimal, except in regional hospitals where a small growth of nurse FTE-s as well head count can be observed. The FTE/Head ratio of nursing staff in regional hospitals is lower than in general hospitals.

The share of female predominance in nurse profession has been historically high as 97% with no change over the last five years.

In general, the average age of nurses is slightly increasing from 42,9 years in 2015 to 44 years in 2019. All nursing specialty groups have almost similar average age. Only the category “other” has app.10% higher average value.

Figure 12 Distribution of nurses by average age



4.1.1.3 Mapping of technical medical personnel in hospitals.

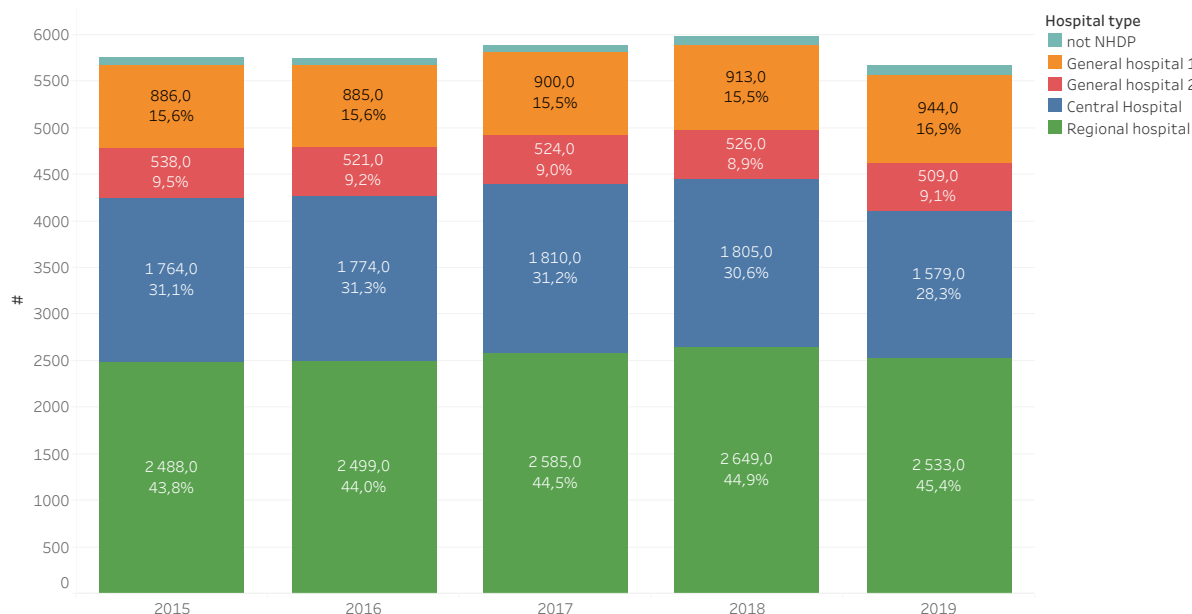
For the analysis a distribution of technical medical personnel was decided in coordination with OWG to use the same grouping as presented in the survey “Tulevikuvaade töäjõu- ja oskuste vajadusele: tervishoid” conducted by SA Kutsekoda in 2017. It includes unregulated professions with a specific curriculum in tertiary education such as bioanalysts, optometrists, care givers, medical technicians, radiology technicians, etc.²⁰

In the last five years both FTE-s and head count of technical medical personnel in two biggest regional hospitals have made a curve, being increased from 2015 and then dropped considerably from 2018 to 2019 (see Figure 13 and more detailed information in Annex 1). Tallinn Children’s Hospital has a contrary outlier trend with 100% increase in technical personnel, while overall service volumes of the hospital actually decreasing.

²⁰ “Tulevikuvaade töäjõu- ja oskuste vajadusele: tervishoid”, SA Kutsekoda, Tallinn, 2017, https://oska.kutsekoda.ee/wp-content/uploads/2016/04/tervishoiu_uuringu_terviktekst.pdf

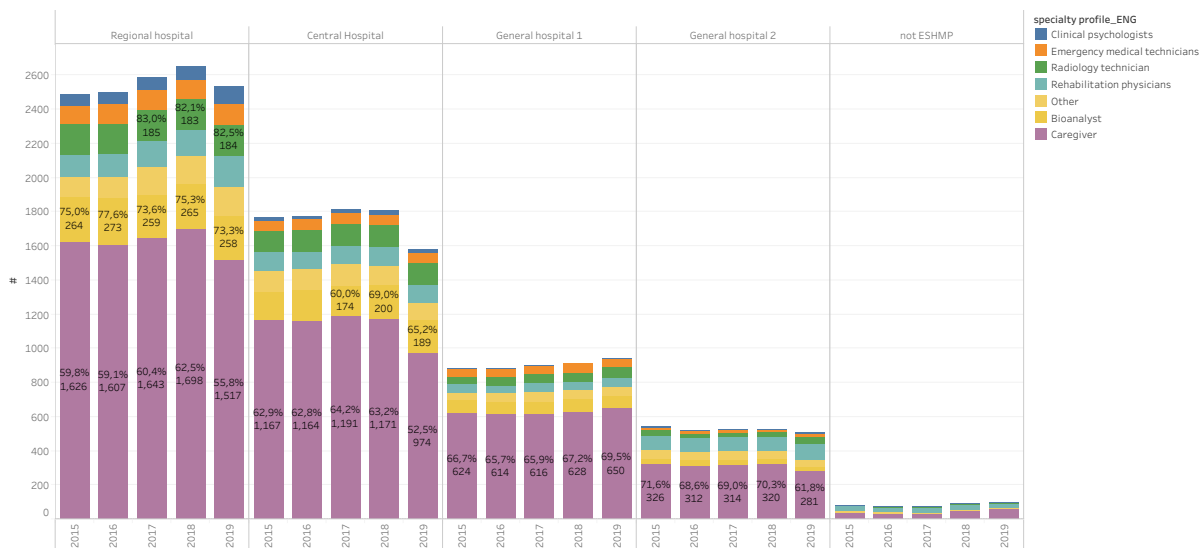
The similar pattern of recent decrease in the FTE-s and headcount of technical medical staff can be observed in central hospitals and in general hospitals Group 2, as general hospitals in Group 1 have a moderate increase.

Figure 13 Distribution of other medical personnel by the type of hospitals



The main reason for decrease in technical staff is due to reduction of FTE and headcount of caregivers and other categories remaining mostly unchanged.

Figure 14 Number of technical medical personnel by occupational categories



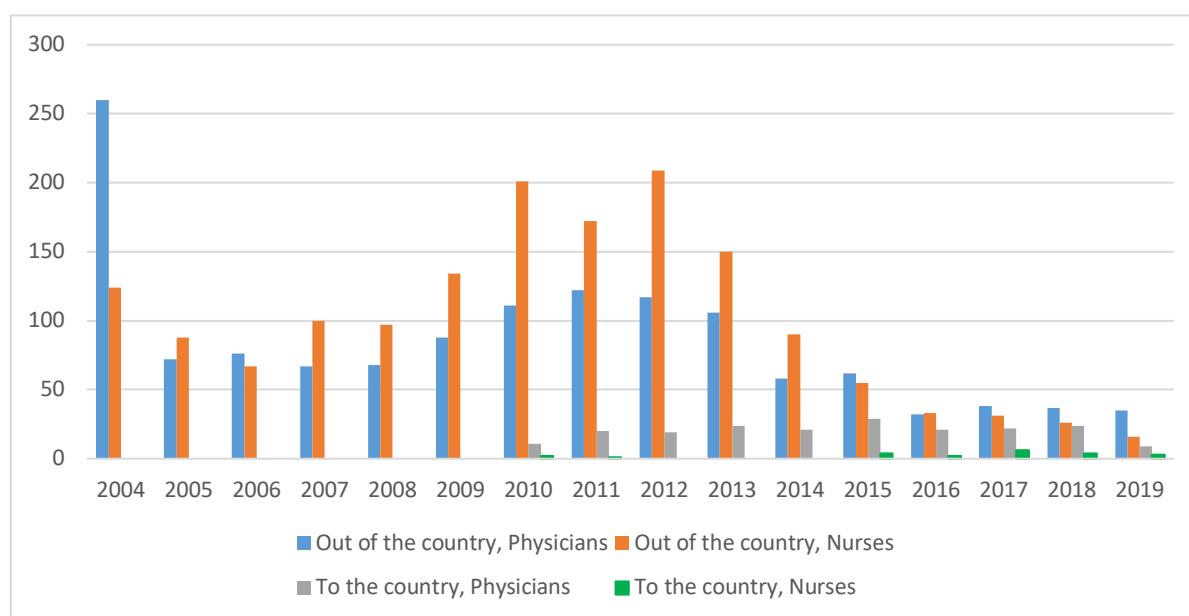
4.1.2 Migration of physicians/medical doctors and nurses.

The information to map migration of physicians and nurses can be derived from the Estonian Health Care Professionals Register that includes data on licenced medical personnel in the country. However, the statistics on outflow and inflow of physicians and nurses from and to the country is not reliable. The only option to study outflow of medical specialists from the

country is to analyse the number of specialists, who have requested a certificate about their education and licence to work from the Health Board. However, there is any follow-up whether the person after receiving a certificate actually left the country or not. Thus, the number of issued certificates indicates merely an interest to leave the country but is not a proof on leaving. According to the Health Board statistics the number of non-EU countries as potential target to work is very small²¹. In conclusion, credibility of the statistics the Health Board on the outflow of Estonian medical specialists from is rather questionable. Figure 15 indicates that during the last economic recession the number of requests for certificates to leave the country increased significantly (the blue bars), followed by a decrease below the initial level. During the recent years the level of requests for certificates is relatively low.

When doctors and nurses work abroad, their license remains valid in Estonia and they are not obliged to register their return to the country. Because of that, the real re-migration of medical specialist can't be monitored. The only trustworthy statistics can be found about foreign medical specialist who apply a job in Estonia. They have to pass a full procedure to get the licence and the Health Board has exact statistics about that. It should be mentioned that foreign specialist inflow to Estonia has been modest, however, with some increase until 2019.

Figure 15 Migration of doctors and nurses in Estonian healthcare market



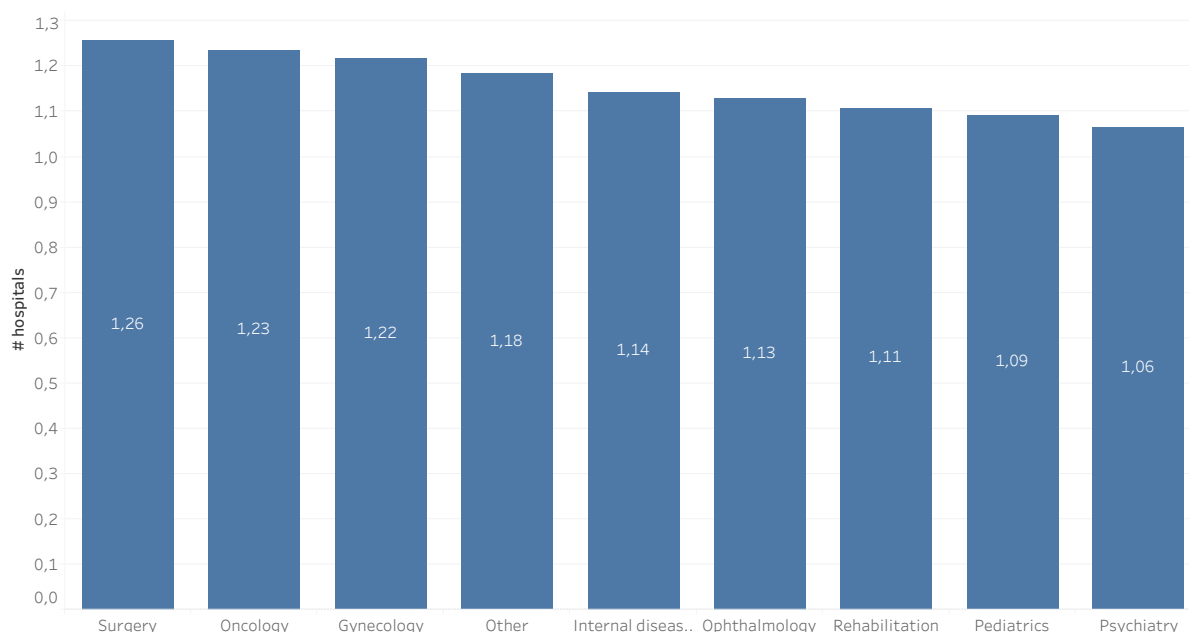
4.1.3 Employment and workload of physicians/medical doctors.

As it was demonstrated above the doctors FTE/Head ratio has had small tendency to decline, which potentially is a proof that doctors tend to work for more than at one employer. This was also confirmed by the management boards during our visits to hospitals. Particular phenomenon is not necessarily negative and follows broader trend in employment relations. This is also a feature of networking of hospitals, as doctors from a “parent” hospital work for general hospitals, particularly considering the need to fill the existing gaps.

²¹https://www.terviseamet.ee/sites/default/files/Tervishoid/kutsekvalifikatsiooni_tunnustamise_toendite_valjastamine_2020.pdf
https://www.terviseamet.ee/sites/default/files/elfinder/article_files/tervishoiutootajate_migratsioon_2004-2017.xls

Nearly 18% of physicians are working for more than one employer, and some even for three or more hospitals. It should be mentioned that the current data reflect only the doctors working in hospitals and does not take into account private outpatient practices²². Surgery, oncology and gynaecology are the medical specialties where doctors tend have multiple employers more often than other specialties. At the same time, 6,7% of physicians have several licences and work in several medical profiles.

Figure 16 Average number of hospitals per doctor by medical specialty



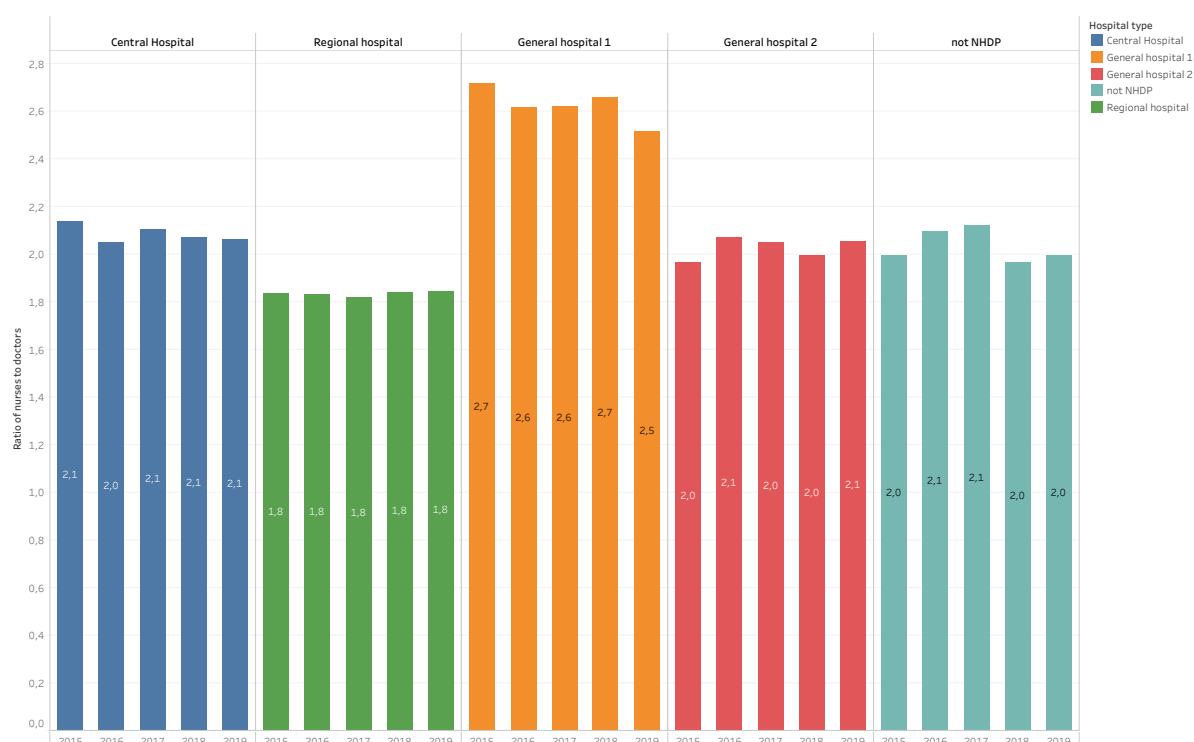
4.1.4 Ratio of doctors and nurses working in hospitals.

One of the indicators monitored internationally to illustrate the efficiency of work organization in the healthcare system is the ratio of nurses per physician. Recent developments in developed countries indicate that nurses are more empowered and qualified to perform individual work than earlier, and this allows to shift more functions to nursing staff. The Estonian ratio of physicians and nurses in Estonian hospitals is illustrated In Figure 16, the Estonian hospitals' FTE-s nurses per doctor ratio is presented. The headcount-based analysis would be problematic as more doctors than nurse are working part time.

The lowest ratio of nurses per physician is in regional hospitals (1,8) and central hospitals (2,1). In general hospitals Group 1 the ratio is 2,5, down from 2,7 in 2015. Despite of lower technological complexity of service-mix and higher share of nursing related services, the ratio in general hospital Group 2 is similar to central hospitals group average (2,1).

²² Based on matching the NIHD data with ID codes of physicians working in the hospitals included in the scope of the study. Other private hospitals and outpatient clinics were not included as their share in the overall health care service volume being relatively small.

Figure 17 Doctor/nurse ratio in hospitals



4.1.5 Benchmark of key information on human resources with international data

In order to understand the current status on human resources in the country, it is important to compare the results of the mapping with international data. It was decided that benchmarking of key information will be focused primarily with Eurostat and OECD average values and a few countries with the current demographic situation that Estonia can expect to have in the years to come. The latest official data from 2020 reflecting statistics based on 2019 was used. Respectively, developments in health care infrastructure and services in these countries may potentially provide valuable information and can be target for benchmarking. Based on these consideration, Sweden, Denmark and Netherlands were selected to this group. However, the data from Sweden is not available in all data categories.

Most common indicators used internationally for comparison of human resources in health care of Estonia were used for benchmarking²³:

- Physicians total per 1000 population,
- Physicians total in hospitals per 1000 population,
- Nurses total per 1000 population,
- Nurses total in hospitals per 1000 population,
- Nurses/physicians ratio total,
- Nurses/physicians ratio in hospitals.

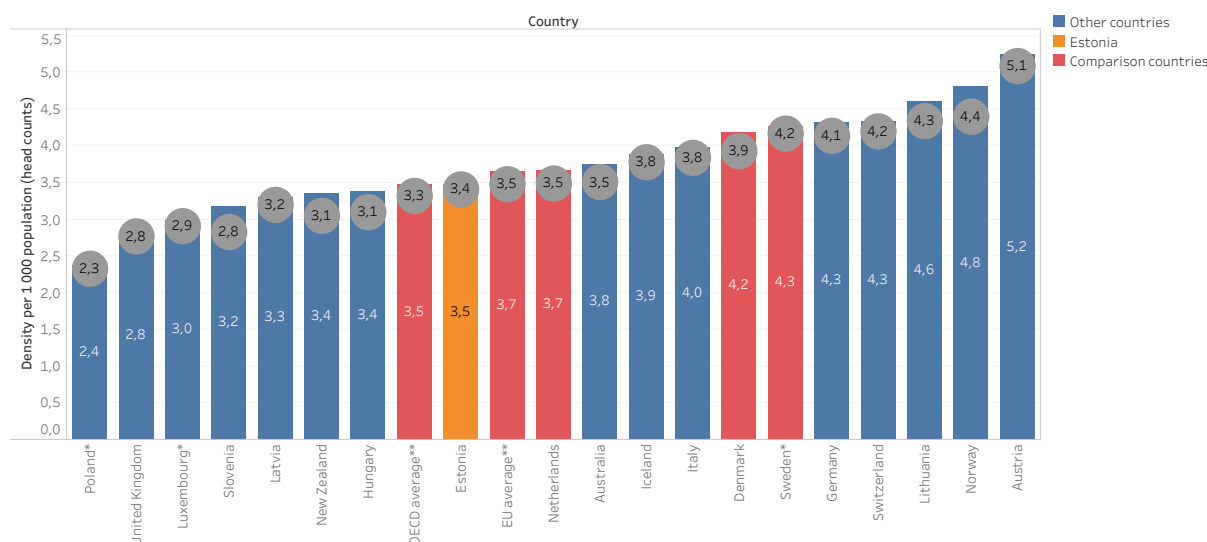
As information about FTE-s in hospitals are not reported by many countries only headcount benchmarking conducted.

²³ As information about FTE-s in hospitals are not reported by many countries only headcount benchmarking conducted.

4.1.5.1 Physicians total per 1000 population.

There are 3,5 physicians in Estonia per 1000 population, being at the same reference level with OECD average, and a little lower than the value for the EU average and Netherlands (3,7). Two target benchmark countries, Sweden and Denmark have the number physicians per 1000 population higher than in Estonia 4,3 and 4,2 respectively. Recent OECD statistics for 2015-2018 indicate that the number of physicians per 1000 population have increased in most of the OECD countries (up to 10% in some countries). In some countries it can be caused also due to shrinking population and not by actual increase in the number of doctors. In Estonia we can observe both trends: during the analysed period the actual number of doctors has increased with a small decrease in population numbers. Figure 17 demonstrates the change of physicians to 1000 population 2015-2018 (the round gray circle).

Figure 18 Physicians/Medical doctors total per 1000 population 2018



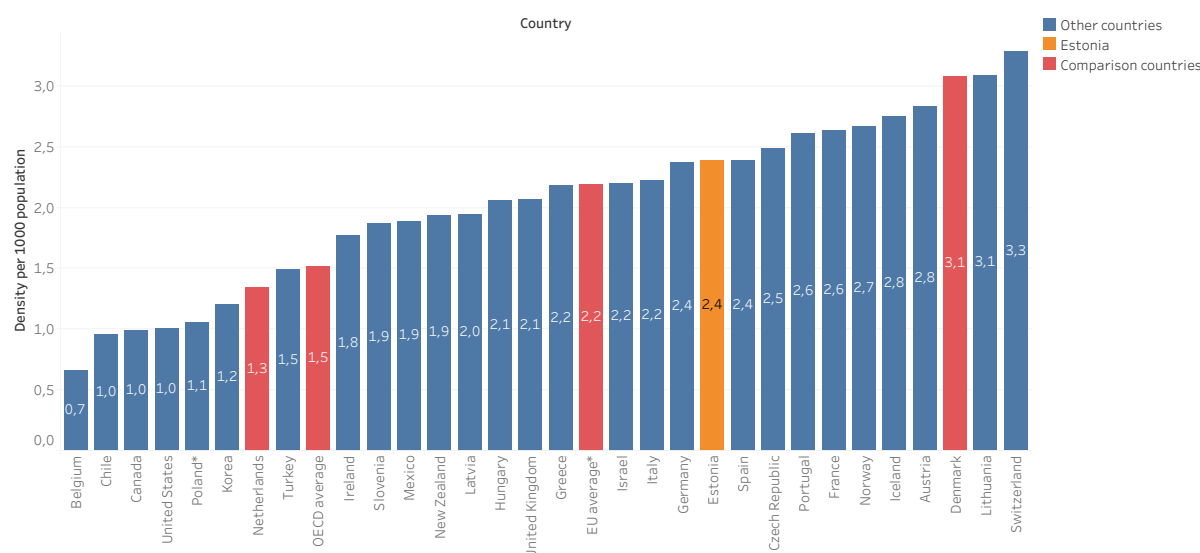
*data available for 2017

**authors calculations, based on OECD and Eurostat data

4.1.5.2 Physicians/Medical doctors in hospitals per 1000 population.

The differences of ratios of physicians per 1000 population in hospitals get bigger in benchmark countries than for doctors in total per population. The ratio in Estonia is 2,4 compared to 2,2 in the EU average and 1,5 as the OECD average. The ratio in Denmark is 3,1 and 1,3 in Netherlands. Data for Sweden is not available.

Figure 19 Physicians/Medical doctors in hospitals per 1000 population



*data available for 2017

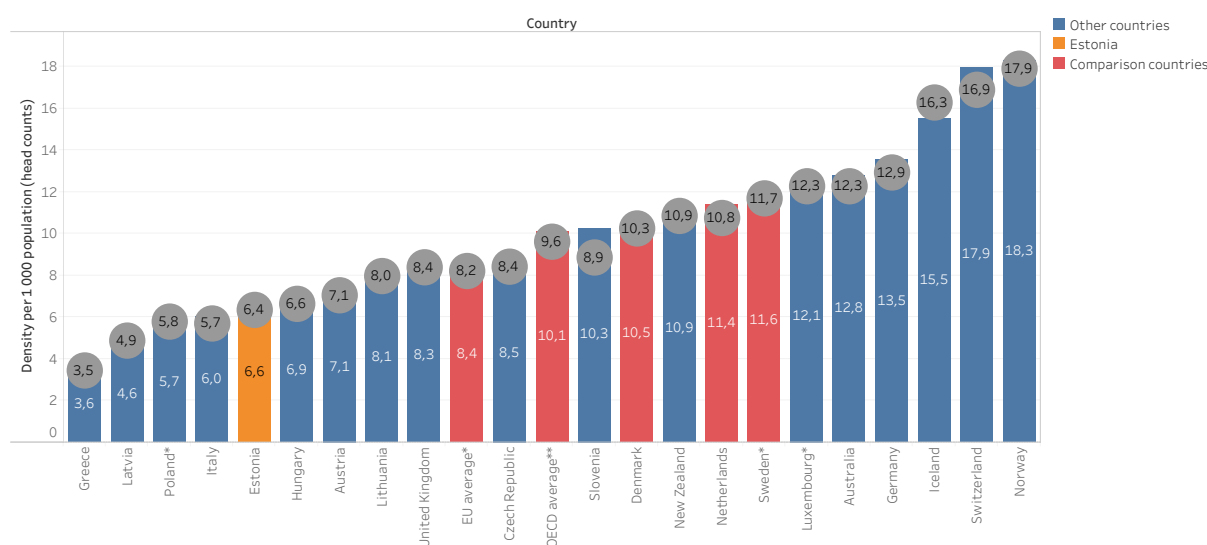
**authors calculations, based on OECD and Eurostat data

4.1.5.3 Nurses total per 1000 population.

Shortage of nursing staff in Estonian health care is well known. The comparative statistics indicates that Estonia with 6,6 nurses per 1000 population has considerably lower ratio compared to 8,9 in EU, 9,0 in OECD countries, 10,5 in Denmark, 11,4 in Netherlands and 11,6 in Sweden. Higher ratio of nurses is a potential measure to improve access to and increase efficiency of services, where physicians can be replaced by nursing competencies.

The international overall 2015-2018 trend indicates in average close to two digit per cent points increase both for the EU and OECD (Figure 19, values in the round gray circles).

Figure 20 Nurses total per 1000 population 2018



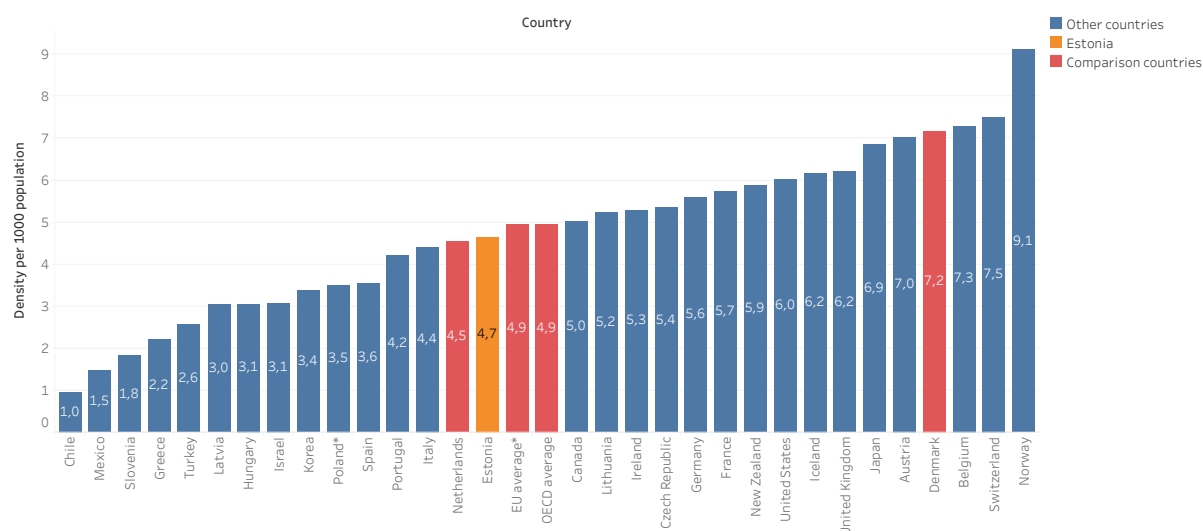
*data available for 2017

**authors calculations, based on OECD and Eurostat data

4.1.5.4 Nurses in hospitals per 1000 population.

The differences in ratios of nurses in hospitals per 1000 population between benchmark countries are smaller than compared to ratio on total nurse count. The ratio of nurses in Estonian hospitals is in the same range with Netherlands, the EU and OECD average (4,5-4,9), while Denmark having distinctively more nurses in hospitals (7,2).

Figure 21 Nurses in hospitals per 1000 population 2018



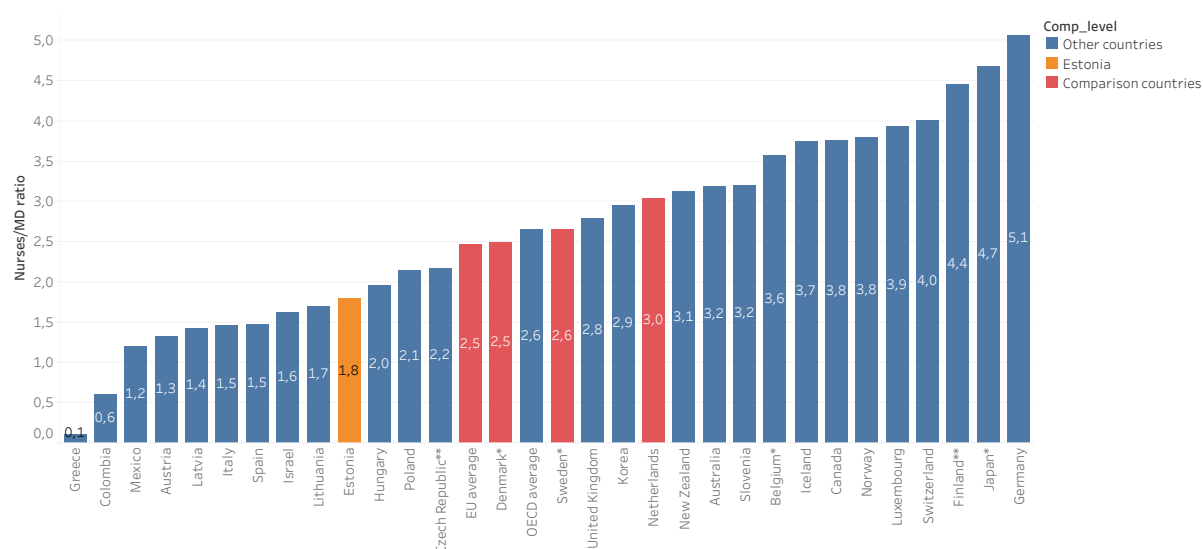
*data available for 2017

**authors calculations, based on OECD and Eurostat data

4.1.5.5 Nurse/doctor ratio total

The ratio of nurses to doctors is a robust indicator of the balance of human resources in the health care sector. The ratio of nurses to doctors in total in Estonia (1,8) is substantially lower than in all benchmark countries: the EU and OECD average, Denmark, Sweden between 2,5-2,6 and Netherlands 3,0. This indicates Estonian health care system to be more doctors' centric and potentially less efficient.

Figure 22 Nurse/doctor ratio total 2018



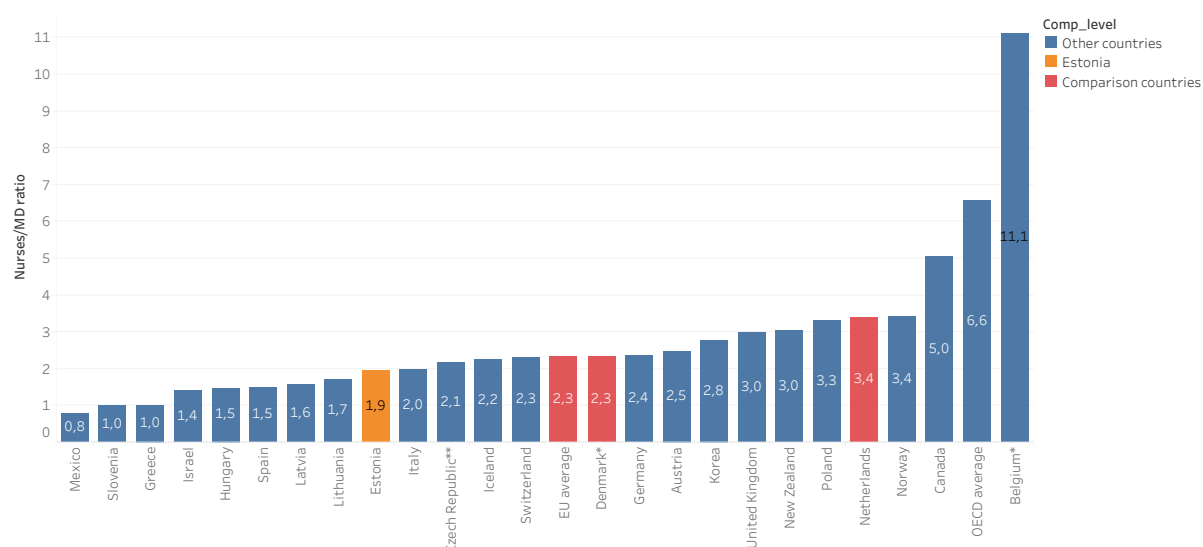
*data available for 2017

**authors calculations, based on OECD and Eurostat data

4.1.5.6 Nurse/doctor ratio in hospitals

The same pattern is for nurses and doctors working in hospitals. Estonia has the lowest ratio of 1,9 nurses per doctor compared to the benchmarks. The EU average and Denmark have nearly 20% higher ratio, while Netherlands having 3,4 and the OECD countries in average 6,6 nurses per doctor in hospitals. The small relative number of nurses in hospitals is a challenge to be addressed in the future.

Figure 23 Nurse/doctor ratio in hospitals 2018



*data available for 2017

**authors calculations, based on OECD and Eurostat data

4.1.6 Different aspects and capacity to deliver person-centred integrated and continues care

4.1.6.1 Staff satisfaction and working environment

Detailed methodology and approach

In six hospitals, focus group interviews were carried out with groups of health care specialists representing wide range of health specialties – doctors (from different professions), head nurses, nursing staff (from different professions), physiotherapists, psychologists, social workers. The purpose of the study was to support overall mapping of hospitals and to provide some value-added view on person centeredness of delivery of the care.

According to the RfS requirements the interviews were conducted at different levels of HNDP hospitals and in different regions of Estonia to gather as broad and representative information as possible. In coordination with the OWG the following hospitals were selected:

- Regional hospitals – NEMC
- Central hospitals – IVCH, Pärnu Hospital
- General hospitals – Põlva Hospital, Järvamaa Hospital, Viljandi Hospital

The interviews were based on a semi-structured qualitative assessment approach focusing in particular on the person/patient centeredness of care, continuity of treatment delivery process, satisfaction of the personnel with the provision of services and the organisation of hospital network. The focus groups consisted in average of 8-10 medical and non-medical specialists, all together 56 people, working closely with patients during the hospitalisation episode. The following specialists were represented in the interviews: doctors, nurses, physiotherapists, psychologists and social workers. The interviews were conducted as face-to-face group meetings in hospitals lasting 60 minutes in average.

As agreed with the OWG, the questions were grouped in blocks to cover specific areas of interest:

- Communication with patients
- Coordination and continuity of provided care
- Involvement of patients' relatives or close people in the process of care

Each block consisted of several open-ended questions (see Annex 2) relevant to the given area of interest. The methodological preparation of the questions included also a study of international practice in this field, for example approach of Picker Institute, NICE UK, WHO, to name a few²⁴. The questions were designed to help to navigate discussion in more holistic way, to support and complement the questions and not just to reflect satisfaction with a single element of care.

The key findings of the interviews are described below, whereas more detailed information on can be found in Annex 2. To avoid fragmentation and repetitions, we have brought combined all closely related issues across different areas.

²⁴ <https://iapo.org.uk/sites/default/files/files/IAPO%20Patient-Centred%20Healthcare%20Indicators%20Review.pdf>

As stressed in methodology section above, the RfS foresees to concentrate on hospitals only and therefore the outcome of the survey can have some respective bias. In order to get broader and more balanced feedback it is recommended to consider future mapping of other players in health care service delivery system, primary health care and social care service providers, in particular.

Findings and analysis

Based on feedback provided by focus groups from the six hospitals on patient-centeredness and continuity of care, the key observations that follow the structure of the interview are presented below.

Knowing the patient and communication with patient.

Despite variety of information sources to learn about the patient's health condition and medical history, there are several constraints referred by the interviewed healthcare specialist teams:

- Inconsistency of referral letters from FD-s on the need for specialist care for patients and medical records describing the health status of the patient. Also, inconsistency in communication with primary care facilities/specialists;
- Incompatibility of information systems and problems in information exchange between hospitals as well as between hospitals and primary care providers;
- Non user-friendly design and structure of EHIS to learn medical history of the patient, high time burden and volume of information to work through. The system does not have a feature to set up specific information queries on specific information needs.
- Delays in data entry on health records into EHIS by primary health care providers as well as on laboratory tests.
- Restrictions in access to EHIS for non-medical professionals working at hospital affect smooth and efficient care process and demand additional efforts to communicate with doctors or nurses, who have access to the information.

Communication with patients was recognized as highly important feature of person-centred healthcare, while several areas of concern were addressed by the interviewees:

- Curricula of healthcare specialists training don't provide relevant skill-mix for communication with patients. Nurses and social workers have advantages over doctors, as their training pays significantly more attention on developing communication skills with patients.
- There is inconsistency in how management of hospitals values communication with patients and how much support is provided to strengthen communication skills of the staff. There was little evidence on regular annual trainings and developing staff communication skills.
- Time constraint was pointed out as one of the reasons for inadequate communication by doctors with patients. To fill this gap, there is an increasing role of nurses. However, patients expect comprehensive and detailed information on their health status, performed medical interventions and professional recommendations how to handle the

control over their health in the future. This requires good real-time communication between doctors and nurses.

Continuity of care and coordination of care delivery between the levels and providers of care.

One of the key features of person-centred healthcare is continuity of care and smooth coordination between all levels and stages of care.

- Predominantly all interviewees stressed importance of good cooperation between hospitals and primary care providers. The main issues presented in this area were:
 - The share of avoidable hospitalisations is too high and referral of patients to hospital by family physicians takes place without taking into account potential outpatient treatment possibilities. Delivering quality primary care and keeping more patients at primary health care level is expected by the interviewees.
 - The quality of patients' records in EHIS is not good enough with delays in data entry.
 - Communication with family practitioners and family nurses is hectic and they are often out of reach when there is a need to specify some details in the patient health condition and treatment as PHC staff is busy with their everyday work and not available for on-line communication.
- Better cooperation and communication between PHC providers and hospital staff would support better planning and coordinating of the care, including lowering the share of avoidable hospitalizations.
- The interviewees didn't see severe obstacles to individualise care according to every patient's needs in their own hospital. The situation gets more complicated when a second opinion or a consultation with higher level specialist is needed. Although consultations between specialist doctors from different hospitals is not reimbursed by EHIF, often an appreciated un-paid support between colleagues is possible. This kind of cooperation is easier within „networked“ hospitals as more difficult patients are consulted with the aim to be potential referred into the regional hospital.
- All interviewed teams in “networked” hospitals were satisfied with the networking principles in general. More specifically, they referred to better distribution and alignment of services within different levels of healthcare, available resources (healthcare personnel, medical equipment) and competencies. Optimization of healthcare services between hospitals was rather modest in the beginning of the networking process but has been accelerating and the interviewees in general were supportive to the networking process.
- Moreover, several teams expressed for a need in optimization beyond acute health care services, like nursing care and staff, medical technicians, non-medical support services, procurement, etc.
- Physical environment in hospitals varies, while general hospitals have less favourable conditions compared to central and regional ones, and patients may see less patient-friendly conditions in the terms of privacy wards, hygienic conditions, mobility issues etc.

- Technological capacities to support patient driven needs were assessed by the interviewees as satisfactory, including modern information technology and telemedicine.
- There are problems in coordination of aftercare and rehabilitation after hospital care episodes
 - The coordination and information exchange with rehabilitation hospitals are most satisfactory in the cases a patient is referred with comprehensive treatment instructions and other relevant information.
 - If patient is discharged and left under surveillance of his/her family doctor there is no system or tool to actively inform the family doctor. EHIS does not have an active notification function to attract single practice family doctor's or PHC centre's attention on discharged patients' epicrisis and follow-up treatment instructions. The only way for pro-active follow-up of discharged patients by hospital doctors is to call them for follow-up visits to the hospital.
- In general, the need for social services is increasing and the service level is improving steadily. Hospitals have specialised social workers who among other tasks take care of communicating with municipality structures and third-party service providers.

Enabling patients to participate in their care and involving patient relatives/close ones.

- All interviewed teams gave feedback that they always engage relatives of patients into treatment process when the situation demands. General comment of the healthcare specialists was that relatives of the patients are eager to participate in communication and cooperation.

4.1.6.2 Patient's feedback on treatment experience

Detailed methodology and approach

According to the RfS a patient feedback survey was organised to learn about patient-centredness and continuity of provided care. The selection of hospitals was same as for chapter 4.1.6.2 above.

The survey was planned as a structured qualitative interview with sixty patients (ten from each hospital), who had received hospital service in the last six months. The survey focused on patients' experience of the service provided, patient-centredness of planning and delivery of the service and integration of the service with other pre- and after hospital episode health and social services. The survey was developed using experiences of other international survey tools, such as the WHO Western Pacific Region, NICE UK, NHS UK, as well as experience of the International Alliance of Patient Organizations (Patient-Centered Healthcare Indicators Review), to cover three areas of interest in agreement with OWG:

- Communication with the patient,
- Continuity of the care and coordinating the care process,
- Enabling patients and relatives participate in the care process.

All together 19 questions were designed to cover the three areas. The questions were phrased rather like statements asking patients specific experience with hospital care and related issues. In addition to the qualitative feedback, patients were asked to rate the experience in a scale “disagree – mostly disagree – don't know – mostly agree – agree“. Despite potential

subjectivity of such measurement it allows statistical quantitative analysis and visualisation of the results.

In total 56 phone interviews were conducted, lasting in average 45–60 minutes, allowing the patients to provide substantive feedback and experience in detail, if needed. We were not able to reach four patients: three of them were not available and one patient was newly hospitalised. To avoid any issues with personal data disclosure (name, age, diagnoses, treatment details etc) the selection of patients was done by hospitals. In order ensure correctness and reliability of the design, the survey was coordinated with relevant key organizations in Estonia – Data Protection Inspectorate and Ethics Committee at the National Institute for Health Development.

The survey inclusion criteria and guidelines for hospitals included:

- The hospital service has been provided in the last 6 months.
- Non-emergency services as patient may have been hospitalised unconscious. However, considering that due to COVID 19 outbreak starting from March hospitals delivered mostly emergency care, we had to accept also patients hospitalized through ER and by ambulance.
- Age and gender structure of patients of the group has to be distributed as evenly as possible.
- The group is divided in half between therapeutic and surgical profiles.

In order to broaden the background information, a desktop reading was made of existing patient satisfaction surveys, conducted by different organizations:

- The latest patient satisfaction surveys made by included six hospitals²⁵
- The EHIF coordinated patient satisfaction survey with healthcare services²⁶.
- The Ministry of Social Affairs commissioned report by CENTAR “Development of person-centered health care monitoring methodology”²⁷

Findings and analysis

Hereby we present key findings that follow the main blocks of the survey, while a detailed matrix of responses to the questions and statistical distribution of the feedback is presented in Annex 3.

Communication with the patient.

- In general, patients are satisfied with the communication by doctors and nurses. Particular attention was paid on communication with doctors before of the treatment and informing patients about the course of treatment, explaining comprehensively potential risks and expected outcomes.

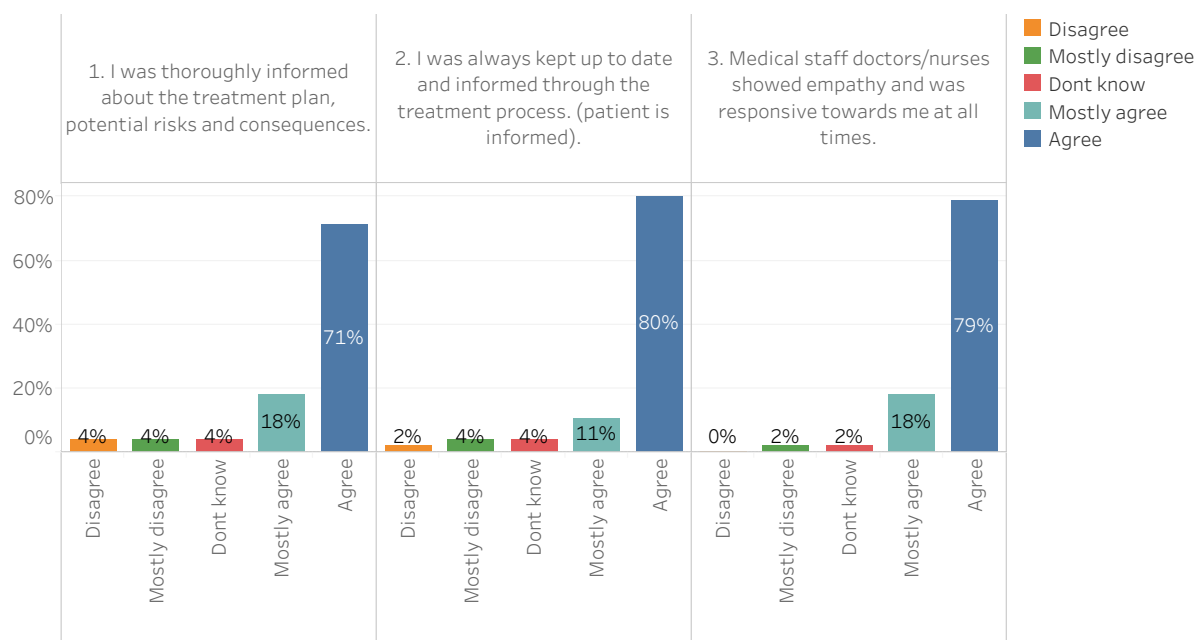
²⁵https://www.regionaalhaigla.ee/sites/default/files/documents/Statsionaarsete_patsientide_rahulolukusitlus_2019.pdf, <https://www.ph.ee/content/editor/files/Ülevaade%202018%20amb%20pt%20rahulolu%20uuringust.pdf>, <https://jmh.ee/wp-content/uploads/2014/05/patsiendi-stats-rahulolu-uuring-2010-jmh.pdf>, <http://ivkh.ee/et/patsiendile-ja-kuelastajale/accepted-medical-specialists-or-health-centers/82-patient-and-visitor/320-tagasiside-ja-kusitlused-2010.html>, <http://ivkh.ee/et/patsiendile-ja-kuelastajale/accepted-medical-specialists-or-health-centers/82-patient-and-visitor/320-tagasiside-ja-kusitlused-2010.html>, http://www.vmh.ee/public/TEAVIK_stats_uuring_THA_61.pdf, http://www.polvahgl.ee/?page_id=1513

²⁶https://www.haigekassa.ee/sites/default/files/uuringud_aruanded/kuvandiuring/Arstiabi%20uuringu%20aruanne%202020.pdf

²⁷https://www.sm.ee/sites/default/files/inimkeskse_tervisesusteemi_seiremetoodika_loppraport_to_undertaking.pdf

- Patients are more satisfied with the volume and clarity of received information, when they were hospitalised on a scheduled basis. This is obvious as in emergency hospitalisation there is not always enough time for a comprehensive communication.
- Patients are also mostly satisfied with the communication during the course of treatment in hospital, while some responders said doctors to be less open and empathic than nurses.
- Significant share of the interviewed patients was elderly and their expectations for the quality of communication and information delivered seemed to be lower than for younger patients.

Figure 24 Patient communication



Vast majority of the interviewed patients were satisfied with communication by personnel, only 2–8% have had negative experience in communication with hospital staff.

Continuity of care and care process coordination.

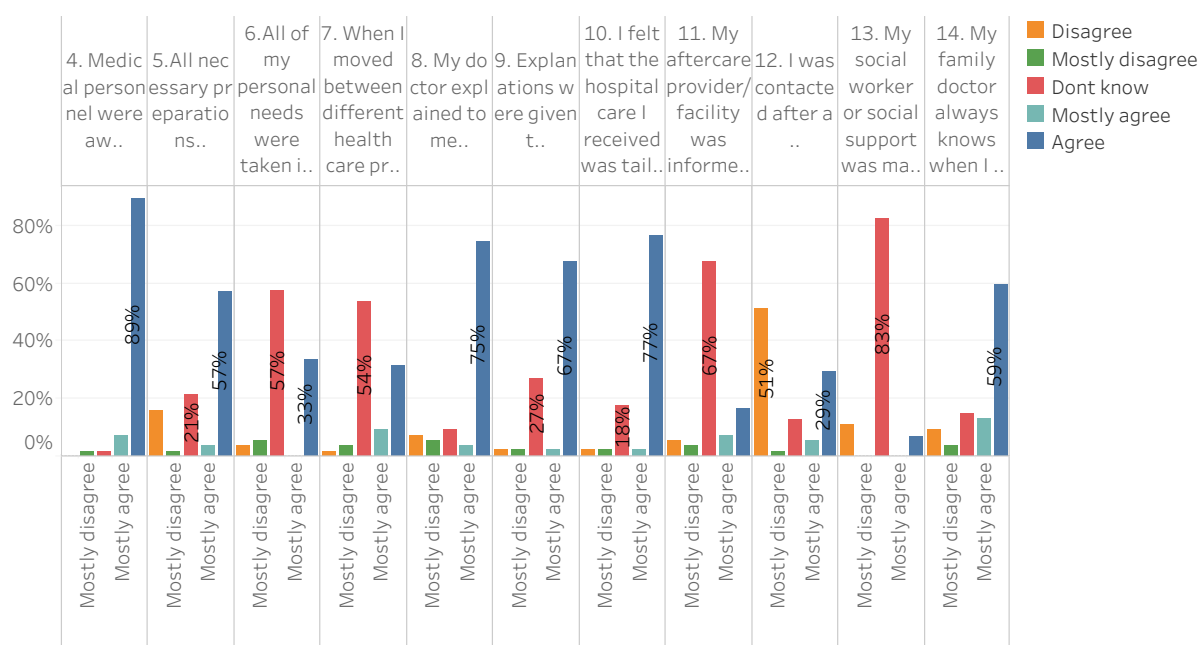
- Most interviewees felt that doctors were aware of their health status, previous illnesses and medical investigations, more in scheduled hospitalisation than through emergency room.
- Patients who were hospitalised on a scheduled basis, indicated that most of medical investigations were done prior to hospitalisation. However, several patients mentioned that despite pre-hospital investigations they still had to undergo some repetitive investigations in the hospital. For obvious reasons patients hospitalized through ER had more extensive scope of medical tests in hospital.
- There were differences in patients experience in information exchange between healthcare providers according to existence of referral letter. Medical records of patients hospitalized with referral notes were visible for hospital doctors. Being discharged they experienced that family practitioners were not informed about their recent hospitalization. As a rule, they had to call to their family practice right after the discharge and inform family practitioner about the need for follow-up after the recent hospitalization.
- Patients who were hospitalized through ER were not sure that their family doctor was aware about their recent hospitalization.

- Few patients were critical about being repetitively asked the same questions in different service provider premises.
- The vast majority of patients were satisfied with recommendations by hospital doctors how to take control over their disease after hospitalisation. The same can be said about prescribing and recommending the use of pharmaceuticals.
- In general patients were satisfied with provided hospital care. They also said they had a feeling that their personal needs were taken into account. Although, very few patients had specific requirements for the care.
- It was difficult to assess whether aftercare was provided smoothly as very few patients needed rehabilitation service. Many patients were recommended to receive nursing care by family practices after the hospitalization. However, response from the patients was that they had to take active role informing family practitioners about their needs and they had a feeling that information hasn't reached family practitioners.
- According to the feedback from patients, a proper monitoring after hospitalisation does not exist.

Figure 25 Continuity of care and care process coordination

Due to limited space in the figure, the questions are not explicitly readable. The figure can be seen also in attached Annex 1 sheet 32. The following list provides the full phrasing of the questions:

4. Medical personnel were aware of my medical history, including chronic diseases, medications which I take and my health behaviour.
5. All necessary preparations and medical tests were done prior to hospitalization, considering my health condition.
6. All of my personal needs were taken into account. (age, personal beliefs, values, diet, allergies, physical disability).
7. When I moved between different health care providers, I felt like my medical record and treatment plan were acquainted by all service providers.
8. My doctor explained to me the next steps and additional healthcare services I may need.
9. Explanations were given to me regarding my medications and their intake.
10. I felt that the hospital care I received was tailored to my needs.
11. My aftercare provider/facility was informed and prepared about my need for continued care.
12. I was contacted after a hospitalization to see how my well-being was.
13. My social worker or social support was made aware of my health condition.
14. My family doctor always knows when I needed hospital service or other health care service.



This block was assessed by patients most critically. In general patients feel that continuity of care is not as smooth as it can be. They also feel that the information exchange between service providers is not organized smoothly. Particular hesitation was made regarding the information flow from hospital to primary care providers, as part of aftercare. Patients are sure that medical records about hospitalization are made, however they can't explain why primary care doctors don't know about these.

Several patients, while giving an assessment, were having difficulty evaluating the score “don't know” or “disagree”, particularly when the statement was not relevant to their experience. Examples are that they didn't need rehabilitation or aftercare service, or they didn't need support from social worker. In these cases, an interpretation of responses varied between “don't know, mostly disagree and disagree” and can be handled together.

Enabling patients and relatives participate in care process.

- Majority of patients experienced positively that they were engaged in planning the treatment process. Many patients referred, that despite an opportunity to be involved in planning the treatment, they fully trust physicians and do not expect to be engaged deeply in taking decisions about the treatment. This was particularly characteristic for elderly patients.
- The standard procedure is when patient is hospitalized, that contacts of relatives are always asked with an aim to be communicated, when the need occurs. However, very few patients had an evident need that their relatives had to be engaged in treatment process. High level of “disagree” indicates no need for family members engagement, but not dis-satisfaction with given feature.
- Despite vast majority of patients said they know to whom to turn when there is urgent need, responses from patients varied to great extent. Roughly half of the patients consider their family doctor is responsible to coordinate their needs, at a time when the rest of the patients think specialist doctor from hospital can help to solve their urgent problems. In overall this indicates that there is no clear understanding among patients how responsibilities and rights are distributed in the healthcare system.

Figure 26 Enabling patients and relatives participate in care process

Due to limited space in the figure, the questions are not explicitly readable. The following list provides the full phrasing of the questions:

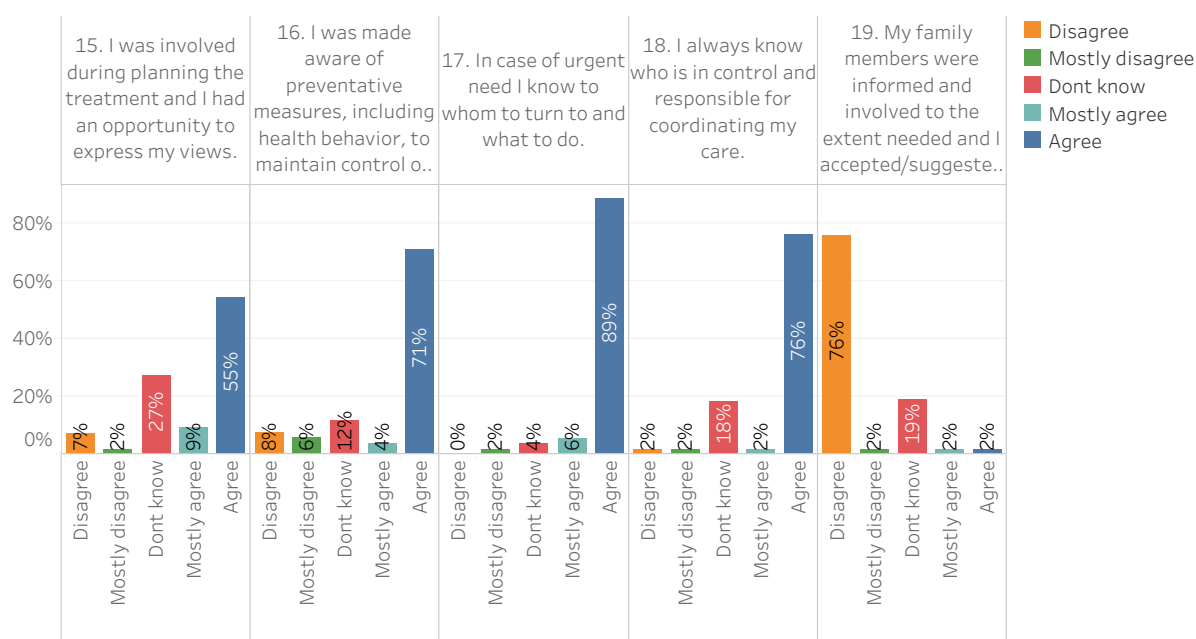
15. I was involved during planning the treatment and I had an opportunity to express my views.

16. I was made aware of preventative measures, including health behaviour, to maintain control over my health condition.

17. In case of urgent need I know to whom to turn to and what to do.

18. I always know who is in control and responsible for coordinating my care.

19. My family members were informed and involved to the extent needed and I accepted/suggested.



4.2 Mapping of hospital infrastructures and usage

Detailed methodology and approach.

To map the current state of infrastructure, a structured questionnaire was compiled and sent to hospitals. The survey covered 20 public-sector-owned hospitals (HNDP hospitals), including 3 regional hospitals, 4 central hospitals, 11 general hospitals, 1 local hospital and 1 special hospital. In addition, three larger private hospitals were included. The selection of hospitals was coordinated with the OWG.

The questionnaire (Annex 5, Table 1 and 2) collected the following basic information from the hospitals regarding the treatment possibilities and technical condition of the physical infrastructure at their disposal:

- (1) information on hospitals' treatment capacities – number of beds, including active care, nursing care and nursing home beds, number of outpatient reception rooms, number of operating rooms, level III intensive care places;
- (2) information reflecting the standard of living in the treatment environment of hospital buildings – the percentage of the ordinary patient rooms furnished with a WC and shower, percentage of single and double rooms out of all rooms;
- (3) information reflecting the hospital buildings' floorspace standard – size of the rooms, outpatient reception rooms and operating rooms and conformity to national requirements, hospital floorspace standard in square metres per bed on the basis of the number of beds listed on the activity licence and on the basis of beds in actual use;
- (4) information reflecting the technical condition of hospital buildings – the amount of enclosed net area in the hospital buildings, the year in which hospital buildings entered use, the year in which hospital buildings underwent a major renovation and/or a partial renovation, the type of structure of the hospital building, an assessment of the technical condition of the hospital structural elements: facade, windows and doors, roofs, stairs, flooring, lifts, heating system, water supply system, electrical system by hospital technicians (users) on the basis of a rating scale provided in the survey;
- (5) information reflecting the age and workloads of the stationary (expensive) imaging diagnostics, isotope imaging diagnostics and radiotherapy equipment – number of devices, year introduced into service and workloads.

Responses to the survey received from hospitals were assessed based on 2000–2018 data from the NIHD Health Statistics and Health Research Database the Estonian Health Insurance Fund database's 2019 data, 1990–2020 data from the Statistics Estonia database, data queries of the Environmental Board Radiation Centre radiation equipment registry and data queries of the Estonian Health Care Licenses Register.

The technical condition of the hospital buildings' utility systems was mapped by the hospital technicians and/or hospital administration staff by giving a score for the technical condition of the technical system of each specific hospital: rating scale – good, satisfactory, poor. The new buildings constructed in the last 20 years and buildings that have undergone major renovations were given a score of 100. Partially renovated buildings received 50 points. The hospital technicians and/or administrative staff rated all separate hospital buildings and blocks declared by the hospital in the course of the survey: the following was assessed: whether the hospital building was established or underwent a major and/or partial renovation in the last 20 years, the type of the buildings' structural solution, technical state of the building structures, doors

and windows, roofs, floors, lifts, heating system, water supply system and electrical supply system and security of electrical supply.

Findings

4.2.1 Changes in the Estonian population, 1990–2020

Estonia's population has been steadily declining over the last 30 years. According to data on 1990-2020 from the Statistics Estonia database:

- The number of births per year has dropped by 8000 over the last 30 years. As of 2019, ten children were born per 1000 inhabitants, the average life expectancy at birth is 8 years higher than 30 years ago: 74.4 years for men and 82.8 years for women.
- Mortality rates are dropping. The main causes of death have remained the same throughout the period: diseases of the circulatory system , neoplasms, injuries and poisonings.
- The share of elderly in the population is increasing by *ca* 1.4% per year. In 2020, 65 years and older group made up to 20% of the total population.
- Compared to 30 years ago the age structure of the population has changed, there are 39% fewer people aged 19 and under, 16% fewer people aged 20 to 64 (working age people) and 47% more people 65 years of age and older (retirement age). The share of the population aged 20–64 has decreased by 148 082 people in absolute figures over the last 30 years, while the share of those aged 65 and older has increased by 84 683 people. The increase of youth age group (0-19 years) is one-quarter smaller than retired one.
- While birth rate per woman has remained stable, the number of births is decreasing because fewer women are entering the child-bearing age group than are leaving it. Furthermore, a birth coefficient of 1.6 means that the generation being born is smaller than the child-bearing generation. In the longer term, the result is inevitably continuing population decrease without taking immigration into account.
- Harju and Tartu counties stand out having the smallest number of elderly (18% aged 65 and over) and higher birth rate, while Ida-Viru County has the lowest birth rate and highest death rate. (Table 2)

Table 2 Population changes by county, 1990–2020. Size of county hospital service area in the home county. Source: Statistics Estonia. Estonian Health Insurance Fund

Reference period	1990	2000	2010	2020	Population changes 1990-2020	Share of population changes 2020	Share of home county patients (EHIF database's 2019 data)	Size of catchment area in the home county (EHIF and Statistics Estonia database's 2019 data)
County								
All of Estonia	1,570,599	1,401,250	1,333,290	1,328,976	-241,623	-15%		
65-85 and older	181,605	208,210	232,450	266,288	84,683	47%		
Harju County	607,158	536,470	556,650	605,029	-2,129	0%	93%	562,677
65-85 and older	61,484	72,370	86,280	106,801	45,317	74%		
Hiiu County	11,332	10,000	8,850	9,315	-2,017	-18%	45%	4,192
65-85 and older	1,305	1,530	1,650	2,073	768	59%		
Ida-Viru County	221,807	183,850	158,800	134,259	-87,548	-39%	77%	103,379
65-85 and older	21,216	29,170	30,370	33,714	12,498	59%		
Jõgeva County	42,607	38,760	33,040	28,442	-14,165	-33%	43%	12,230
65-85 and older	5,801	6,040	6,750	6,945	1,144	20%		
Järva County	43,715	38,130	32,490	30,174	-13,541	-31%	56%	16,897
65-85 and older	5,535	5,720	6,230	7,051	1,516	27%		
Lääne County	33,694	29,610	25,510	20,444	-13,250	-39%	63%	12,880
65-85 and older	4,021	4,350	4,940	4,822	801	20%		
Lääne-Viru County	79,767	71,580	63,230	58,862	-20,905	-26%	59%	34,729
65-85 ja vanemad	9,812	10,930	11,720	12,880	3,068	31%		
Põlva County	36,186	32,250	28,650	24,647	-11,539	-32%	40%	9,859
65-85 and older	5,669	5,710	5,900	5,609	-60	-1%		
Pärnu County	99,863	93,020	86,590	86,185	-13,678	-14%	80%	68,948
65-85 and older	13,063	14,820	16,850	19,056	5,993	46%		
Rapla County	39,717	38,190	36,070	33,282	-6,435	-16%	43%	14,311
65-85 and older	5,298	5,630	6,270	6,718	1,420	27%		
Saare County	39,890	35,850	32,280	33,083	-6,807	-17%	74%	24,481
65-85 and older	5,387	5,830	6,470	7,202	1,815	34%		
Tartu County	162,924	158,070	153,780	153,317	-9,607	-6%	88%	134,919
65-85 and older	20,364	22,530	24,600	27,573	7,209	35%		
Valga County	41,515	36,070	31,930	28,204	-13,311	-32%	51%	14,384
65-85 and older	6,210	6,470	6,900	6,572	362	6%		
Viljandi County	65,135	59,150	50,360	46,161	-18,974	-29%	67%	30,928
65-85 and older	9,466	9,850	10,260	10,764	1,298	14%		
Võru County	45,289	40,250	35,060	35,415	-9,874	-22%	56%	19,832
65-85 and older	6,974	7,260	7,260	7,963	989	14%		

4.2.2 Changes in hospital service areas

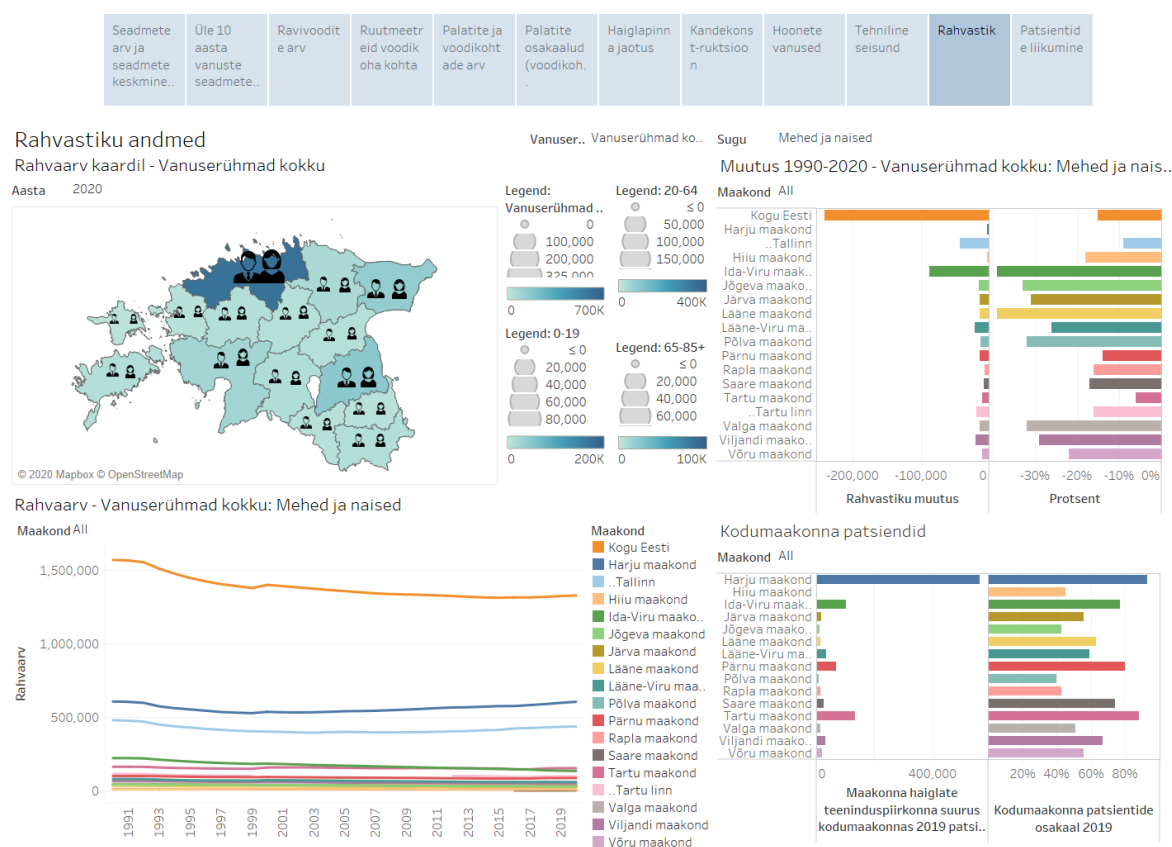
Harju and Tartu counties with their stable population numbers and with their leading position in the countries health care hierarchy, have kept their hospitals' catchment areas (CA-s) unchanged or even increased since the major hospital system reform implementation 15 years ago (EHMP2015). As the result, the share of healthcare services (treatment cases) used by population in their home county is under 50% in four counties (Hiiu, Jõgeva, Põlva, Rapla) and under 60% in another four counties (Järva, Lääne-Viru, Valga, Võru). (Annex 5, Table 3). In most cases when treatment is provided outside the home county, the patients are referring to the closest central hospital or regional hospital. Only a small share of the patients who receive treatment outside their home county go to general hospital in the neighbouring county.

Table 3 Share of cases treated by county in 2019 Source: Estonian Health Insurance Fund

Share of cases treated in the county																
Patients county of residence	Harju County	Hiiu County	Ida-Viru County	Jõgeva County	Järva County	Lääne County	Lääne-Viru County	Põlva County	Pärnu County	Rapla County	Saare County	Tartu County	Valga County	Viljandi County	Võru County	Grand Total
Harju County	93%	0%	1%	0%	0%	1%	0%	0%	1%	0%	0%	3%	0%	0%	0%	100%
Hiiu County	44%	45%	0%	0%	0%	5%	0%	0%	1%	0%	1%	3%	0%	0%	0%	100%
Ida-Viru County	11%	0%	77%	0%	0%	0%	1%	0%	0%	0%	0%	11%	0%	0%	0%	100%
Jõgeva County	6%	0%	1%	43%	1%	0%	1%	0%	0%	0%	0%	45%	0%	3%	1%	100%
Järva County	21%	0%	0%	1%	56%	0%	2%	0%	1%	2%	0%	13%	0%	3%	0%	100%
Lääne County	31%	0%	0%	0%	0%	63%	0%	0%	2%	0%	0%	2%	0%	0%	0%	100%
Lääne-Viru County	26%	0%	2%	1%	1%	0%	59%	0%	0%	0%	0%	9%	0%	0%	0%	100%
Põlva County	4%	0%	0%	0%	0%	0%	0%	40%	0%	0%	0%	47%	0%	0%	7%	100%
Pärnu County	14%	0%	0%	0%	0%	1%	0%	0%	80%	0%	0%	4%	0%	1%	0%	100%
Rapla County	45%	0%	0%	0%	1%	1%	0%	0%	7%	43%	0%	3%	0%	0%	0%	100%
Saare County	21%	0%	0%	0%	0%	0%	0%	0%	2%	0%	74%	3%	0%	0%	0%	100%
Tartu County	7%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	88%	0%	0%	2%	100%
Valga County	5%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	39%	51%	1%	3%	100%
Viljandi County	5%	0%	0%	1%	0%	0%	0%	0%	2%	0%	0%	24%	0%	67%	0%	100%
Võru County	5%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	34%	1%	0%	56%	100%

Based on the share of patients treated in their county of residence we can model actual estimated CA population of general hospitals: Hiiumaa Hospital – 4192; Jõgeva Hospital – 12,230; Põlva Hospital – 9859; Raplamaa Hospital – 14 311. The estimated modelled CA of Järva, Läänemaa, Valga and Võru hospitals is also smaller than 20,000 people, whereas for Rakvere, Kuressaare and Viljandi hospitals range from 24,000 to 35,000 people. The sizes of catchment area population for Harju, Tartu, Ida-Viru and Pärnu hospitals range from 69,000 to 563,000 people (Table 2).

Figure 27 Population changes by county, 1990–2020. Size of county hospital service area in the home county. Source: Statistics Estonia. Estonian Health Insurance Fund



4.2.3 Changes in the use of hospital resources

Based on advancement in modern diagnostics and treatment methods, the average length of stay has shortened substantially in Estonia. This, accompanied by a material decrease in population numbers, has led in some hospitals to a suboptimal bed occupancy and half-empty hospital buildings. (Table 4)

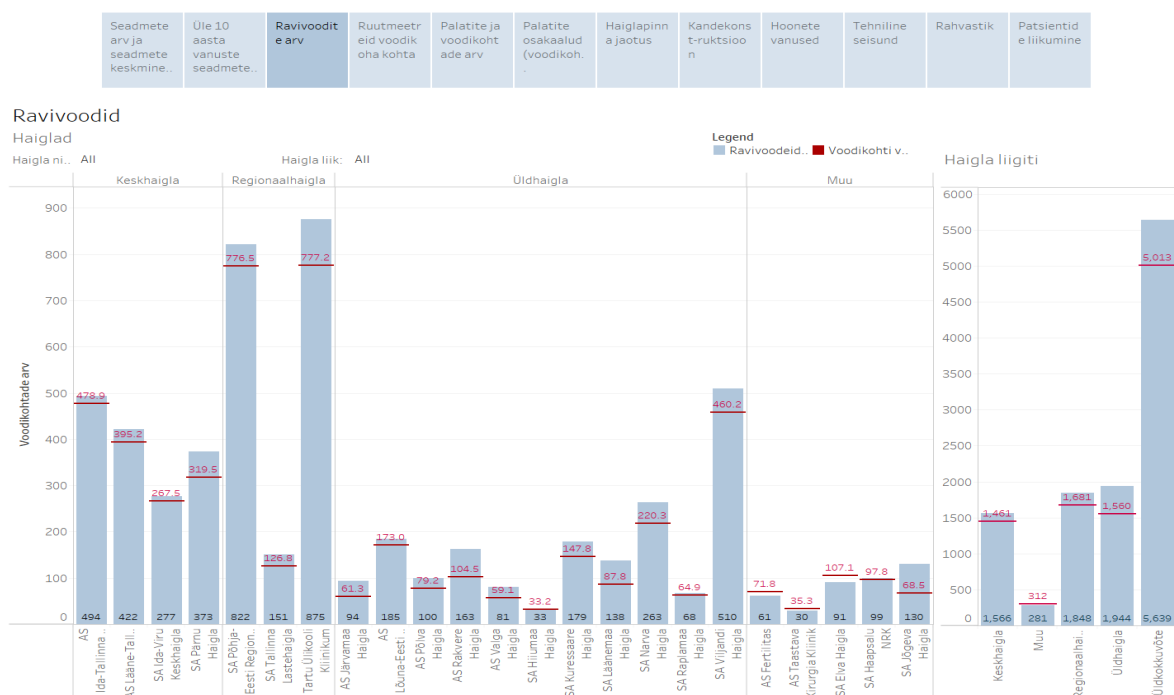
Table 4 Number of beds (permitted beds by the Health Board licence; number of beds in use, source: hospital; average number of beds, source: NIHD); bed occupancy, source: NIHD; floorspace standard as declared on activity licence (m² per bed); floorspace standard according to actual use (m² per bed).

Type of hospital	Gross internal area	Bed occupancy rate (NIHD data 2018)	Number of beds according to the hospital licence	Number of beds in use according to hospital information	Average number of active treatment beds (NIHD data 2018)	Number of other beds (nursing home, etc.)	Number of nursing beds	Number of beds in actual use (average number of active treatment beds, other beds and nursing beds combined)	Number of beds in 100% bed occupancy rate	Number of beds in 85% bed occupancy rate	sqm per bed according to the hospital licence	sqm per bed according to the actual use	sqm per bed according to the hospital information
Regional Hospitals	294,454		2,560	2,457	1,697	0	151	1,848	1,429	1,681	115	159	120
North Estonia Medical Centre	123,086	80	1,329	1,291	782		40	822	660	777	93	150	95
Tallinn Children's Hospital	35,124	71	184	150	151			151	108	127	191	233	234
Tartu University Hospital	136,244	76	1,047	1,016	764	0	111	875	661	777	130	156	134
Central Hospitals	201,147		1,898	1,803	1,089	67	410	1,566	1,242	1,461	106	128	112
East-Tallinn Central Hospital	67,908	82	650	582	364	0	130	494	407	479	104	137	117
East-Viru Central Hospital	35,144	82	335	308	187	40	50	277	227	268	105	127	114
Pärnu Hospital	43,689	73	427	427	266	27	80	373	272	319	102	117	102
West-Tallinn Central Hospital	54,406	80	486	486	272		150	422	336	395	112	129	112
General Hospitals	198,828		2,264	1,998	960	426	558	1,944	1,326	1,560	88	102	100
General Hospitals 1	129,816		1,621	1,373	594	341	365	1,300	940	1,106	80	100	95
Kuressaare Hospital	20,216	70	197	197	91	50	38	179	126	148	103	113	103
Narva Hospital	35,291	71	261	249	164	14	85	263	187	220	135	134	142
Rakvere Hospital	17,024	55	219	191	115	0	48	163	89	105	78	104	89
South-Estonian Hospital	18,339	80	270	164	82	30	73	185	147	173	68	99	112
Viljandi Hospital	38,946	77	674	572	142	247	121	510	391	460	58	76	68
General Hospitals 2	69,013		643	625	366	85	193	644	386	454	107	107	110
Hiiu Hospital	2,556	86	37	37	15		18	33	28	33	69	77	69
Järvamaa Hospital	8,153	55	101	101	70		24	94	52	61	81	87	81
Jõgeva Hospital	15,381	45	125	125	70	40	20	130	58	69	123	118	123
Läänemaa Hospital	9,510	54	133	97	53	36	49	138	75	88	72	69	98
Põlva Hospital	13,062	67	100	118	70	0	30	100	67	79	131	131	111
Raplamaa Hospital	5,127	81	67	67	37	9	22	68	55	65	77	75	77
Valga Hospital	15,224	62	80	80	51		30	81	50	59	190	188	190
Other type of hospitals	17,352		284	293	231	0	54	285	269	317	61	61	59
Elva Hospital	3,518		91	91	41		50	91	91	107	39	39	39
Fertilitas	5,056		61	61	61	0	4	65	65	76	83	78	83
Haapsalu Neurological Rehabilitation Centre (HNRC)	7,248	84	102	111	99	0	0	99	83	98	71	73	65
Hospital of Reconstructive Surgery	1,530		30	30	30			30	30	35	51		51
Grand total	711,781		7,006	6,551	3,977	493	1,173	5,643	4,265	5,018	102	126	109

Internationally, bed occupancy of 85% is considered to be the goal to get highest efficiency in hospital operations. In the EHMP2015 the goal by 2015 was set at 83%. In our mapping, the following hospitals had 80% or higher bed occupancy in 2018: NEMC, ETCH, WTCH, IVCH, SEH, Hiiu Hospital, Raplamaa Hospital. TCH, TUH, Pärnu Hospital, Kuressaare Hospital, Narva Hospital, Viljandi Hospital, Läänemaa Hospital had 70–79% bed occupancy.

Bed occupancy in general hospitals like Järvamaa Hospital, Põlva Hospital, Rakvere Hospital, Valga Hospital and local Jõgeva Hospital was much lower than optimal (45–69%).

Figure 28 Number of beds in use (average number of beds, source: NIHD), red line: number of needed beds if the bed occupancy would reach 85%



4.2.4 Overview of the condition of Estonian hospital infrastructure

Estonian hospitals have 712,000 m² of gross internal area (GIA)²⁸ of which 376,000 m² (53%) were either recently built or underwent major renovation and 51,000 m² (7%) were partially repaired. In 35% (246,000 m²) of hospital buildings have ventilation systems equipped with automatic climate control. 14% of GIA is older than 50 years, 35% between 31-50 years and 46% is built in the last 20 years. (Table 5)

²⁸ The enclosed area of a building within the external walls taking each floor into account but excluding the thickness of the external walls.

Table 5 Age of hospital buildings

Type of hospital	Gross internal area	Number of beds	Built in 1866-1969; Buildings over 50 years	Share of buildings over 50 years	Built in 1970-1989; buildings 50-31 years	Share of buildings 50-31 years	Built in 1990-2020; Buildings under 30 years	Share of buildings under 30 years	Built in 2000-2020; buildings under 20 years	Share of buildings under 20 years
Regional Hospitals	294,454	2,671	46,479	16%	98,215	33%	162,760	55%	146,180	50%
North Estonia Medical Centre	123,086	1,329	20,274	16%	42,737	35%	60,075	49%	60,075	49%
Tallinn Children's Hospital	35,124	184	13,000	37%	13,000	37%	22,124	63%	21,671	62%
Tartu University Hospital	136,244	1,158	13,205	10%	42,478	31%	80,561	59%	64,434	47%
Central Hospitals	201,146.20	1,989.00	27,621.90	14%	68,669.50	34%	104,854.80	52%	94,920.20	47%
East-Tallinn Central Hospital	67,907	650	11,790	17%	42,574	63%	13,544	20%	4,087	6%
West-Tallinn Central Hospital	54,406	577	768	1%	26,096	48%	27,542	51%	27,542	51%
East-Viru Central Hospital	35,144	335	15,064	43%	0	0%	20,080	57%	19,602	56%
Pärnu Hospital	43,689	427	0	0%	0	0%	43,689	100%	43,689	100%
General Hospitals 1	129,816	1,621	20,271	16%	43,053	33%	66,492	51%	57,395	44%
Kuressaare Hospital	20,216	197	0	0%	0	0%	20,216	100%	20,216	100%
Narva Hospital	35,291	261	7,669	22%	1,954	6%	25,669	73%	16,572	47%
Rakvere Hospital	17,024	219	2,542	15%	777	5%	13,705	81%	13,705	81%
South-Estonian Hospital	18,339	270	0	0%	18,339	100%	0	0%	0	0%
Viljandi Hospital	38,946	674	10,060	26%	21,983	56%	6,903	18%	6,903	18%
General Hospitals 2	69,013	643	2,556	4%	37,264	54%	29,193	42%	24,662	36%
Järvamaa Hospital	8,153	101	0	0%	906	11%	7,247	89%	2,716	33%
Põlva Hospital	13,062	100	0	0%	13,062	100%	0	0%	0	0%
Valga Hospital	15,224	80	0	0%	0	0%	15,224	100%	15,224	100%
Hiumaa Hospital	2,556	37	2,556	100%	0	0%	0	0%	0	0%
Jõgeva Hospital	15,381	125	0	0%	15,381	100%	0	0%	0	0%
Läänemaa Hospital	9,510	133	0	0%	7,915	83%	1,595	17%	1,595	17%
Raplamaa Hospital	5,127	67	0	0%	0	0%	5,127	100%	5,127	100%
Other type of hospitals	17,352	284	0	0%	5,048	29%	12,304	71%	5,056	29%
Fertilitas	5,056	61	0	0%	0	0%	5,056	100%	5,056	100%
Elva Hospital	3,518	91	0	0%	3,518	100%	0	0%	0	0%
Haapsalu Neurological Rehabilitation Centre (HNRC)	7,248	102	0	0%	0	0%	7,248	100%	0	0%
Hospital of Reconstructive Surgery	1,530	30		0%	1,530	100%		0%		0%
Grand total	711,780	7,208	96,928	14%	252,249	35%	375,603	53%	328,213	46%

According to the activity licences issued by the Health Board (HB), hospitals in Estonia have 7006 beds in total of which, at the time of the survey, were in active use 6551 beds. We cross checked the data with the data on average number of active treatment beds in use in 2018 from the NIHD's database. Based on this hospitals actually using *ca* 80% (5643) of the HB issued licenced beds. The average floor area space per a HB licenced bed is 102 m² compared to 126 m² based on NHID actively used bed number referred above.

The hospitals have in total 3115 ordinary (non-intensive care) patient rooms with 6452 beds in use of which 62% are equipped with an oxygen (O₂) supply, 73% are single and double bed rooms accommodating 54% of all ordinary beds. Only 69% of the single and double patient rooms have a toilet and shower. The rest of ordinary patient rooms are large tree and four beds rooms, 56% have a WC and shower. All of the treatment rooms in hospitals meet set requirements. The average floorspace for outpatient room is 18 m² and for operating theatres is 37 m². (Tables 6, 8)

Table 6 Average size of outpatient reception rooms and operating rooms

Type of hospital	Number of outpatient reception rooms	Total gross internal area (GIA) of outpatient reception rooms	Number of operating rooms	Total gross internal area of operating rooms	Average size of outpatient reception rooms	Average size of operating rooms
Regional Hospitals	735.0	13,666.5	58.0	2,467.1	18.6	42.5
North Estonia Medical Centre	247.0	5,334.6	27.0	1,287.0	21.6	47.7
Tallinn Children's Hospital	177.0	3,134.0	4.0	159.2	17.7	39.8
Tartu University Hospital	311.0	5,197.9	27.0	1,020.9	16.7	37.8
Central Hospitals	594.0	9,958.2	40.0	1,435	16.8	35.9
East-Tallinn Central Hospital	144.0	2,644.1	18.0	635	18.4	35.3
East-Viru Central Hospital	98.0	1,669.9	7.0	252	17.0	36.0
Pärnu Hospital	176.0	2,851.0	6.0	238	16.2	39.6
West-Tallinn Central Hospital	176.0	2,793.2	9.0	311	15.9	34.5
General Hospitals	459.0	8,503.8	26.0	894.6	18.5	34.4
General Hospitals 1	336.0	6,464.6	15.0	490.0	19.2	32.7
Kuressaare Hospital	19.0	434.0	3.0	113.0	22.8	37.7
Narva Hospital	66.0	1,326.4	5.0	138.3	20.1	27.7
Rakvere Hospital	99.0	1,897.1	3.0	105.0	19.2	35.0
South-Estonian Hospital	25.0	467.0	2.0	73.7	18.7	36.9
Viljandi Hospital	127.0	2,340.1	2.0	60.0	18.4	30.0
General Hospitals 2	123.0	2,039.2	11.0	404.6	16.6	36.8
Hiiu Hospital	6.0	81.6	1.0	42.0	13.6	42.0
Järvamaa Hospital	50.0	630.0	2.0	75.0	12.6	37.5
Jõgeva Hospital	37.0	836.0	1.0	38.0	22.6	38.0
Läänemaa Hospital			2.0	70.0		35.0
Põlva Hospital	18.0	270.0	2.0	71.0	15.0	35.5
Raplamaa Hospital	12.0	221.6	1.0	30.0	18.5	30.0
Valga Hospital			2.0	78.6		39.3
Other type of hospitals	61.0	967.7	10.0	641.2	15.9	64.1
Elva Hospital	15.0	290.6	1.0	68.0	19.4	68.0
Fertilitas	35.0	540.0	5.0	407.6	15.4	81.5
Haapsalu Neurological Rehabilitation Centre (HNRC)	9.0	114.7	0.0	0.0	12.7	
Hospital of Reconstructive Surgery	2.0	22.4	4.0	165.6	11.2	41.4
Grand total	1,849.0	33,096.1	134.0	5,438.2	17.9	40.6

In 2017, the number of operating theatres in hospitals per 100,000 inhabitants in EU countries²⁹ ranged from 3,8 in Austria to 16,1 in France. Estonia with its 10,0 operating theatres per 100,000 population is in the midway of these two extremes (Table 7).

Table 7 Availability of operating theatres in hospitals, 2017

	Operating theatres	Operating theatres (per 100 000 inhabitants)
Belgium	1,393	12.3
Czechia	876	8.3
Estonia	132	10.0
Ireland	265	5.5
Greece	1,333	12.4
Spain	4,533	9.7
France	10,774	16.1
Croatia	450	10.9
Italy	6,191	10.2
Cyprus	121	14.1
Latvia	297	15.3
Luxembourg	58	9.7
Malta	52	11.1
Netherlands	1,167	6.8
Austria	337	3.8
Poland	3,587	9.5
Portugal	890	8.6
Romania	1,894	9.7
Slovenia	177	8.6
United Kingdom (1)	3,826	5.8
Liechtenstein	6	15.8
Switzerland	1,015	12.0
Serbia	539	7.7
Turkey	6,403	8.0

(1) 2016.

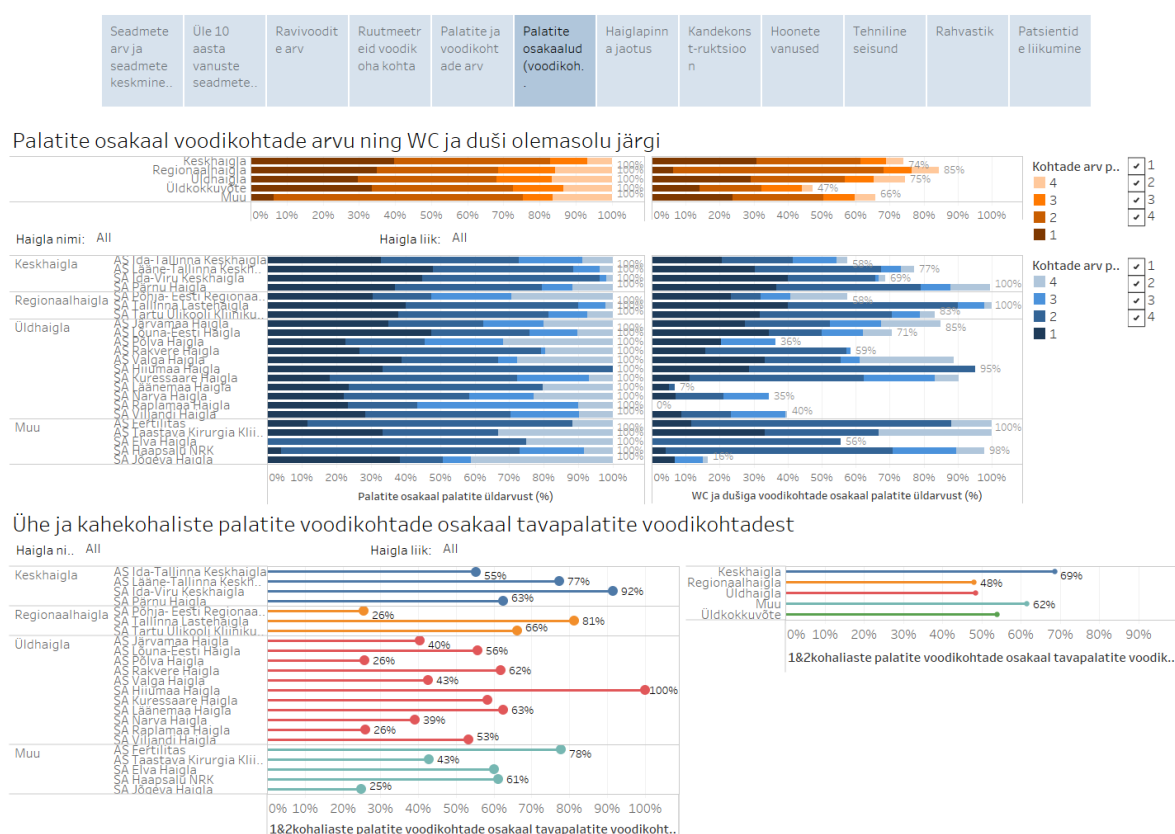
Source: Eurostat (online data code: hlth_rs_tech)

²⁹ Data for the EU average is not available

Table 8 Average size of ordinary patient rooms in Estonian hospitals

Type of hospital	Number of single patient rooms	Total gross internal area of single patient rooms	Number of double patient rooms	Total gross internal area of double patient rooms	Number of triple patient rooms	Total gross internal area of triple patient rooms	Number of quadruple patient rooms	Total gross internal area of quadruple patient rooms	Average size of single patient rooms	Average size of double patient rooms	Average size of triple patient rooms	Average size of quadruple patient rooms
Regional Hospitals	384.0	5,476.2	367.0	7,417.6	172.0	4,224.2	172.0	5,152.7	14.3	20.2	24.6	30.0
North Estonia Medical Centre	132.0	1,717.0	74.0	1,355.0	100.0	2,285.0	128.0	3,691.0	13.0	18.3	22.9	28.8
Tallinn Children's Hospital	36.0	562.0	45.0	1,018.0	7.0	186.0	2.0	73.0	15.6	22.6	26.6	36.5
Tartu University Hospital	216.0	3,197.2	248.0	5,044.6	65.0	1,753.2	42.0	1,388.7	14.8	20.3	27.0	33.1
Central Hospitals	350.0	4,687.2	380.0	7,501.0	89.0	2,428.4	60.0	2,157.3	13.4	19.7	27.3	36.0
East-Tallinn Central Hospital	94.0	1,394.6	113.0	2,027.5	53.0	1,400.3	25.0	693.1	14.8	17.9	26.4	27.7
East-Viru Central Hospital	92.0	1,251.0	105.0	2,226.6	4.0	95.9	4.0	264.9	13.6	21.2	24.0	66.2
Pärnu Hospital	76.0	1,121.0	87.0	1,901.9	18.0	513.2	24.0	981.3	14.8	21.9	28.5	40.9
West-Tallinn Central Hospital	88.0	920.6	75.0	1,345.0	14.0	419.0	7.0	218.0	10.5	17.9	29.9	31.1
General Hospitals	307.0	3,555.6	394.0	5,757.0	160.0	2,362.0	170.0	4,233.4	11.6	14.6	14.8	24.9
General Hospitals 1	213.0	2,680.5	301.0	4,598.3	121.0	1,823.7	93.0	2,319.1	12.6	15.3	15.1	24.9
Kuressaare Hospital	13.0	154.0	39.0	304.0	15.0	297.0	5.0	81.0	11.8	7.8	19.8	16.2
Narva Hospital	25.0	417.2	41.0	730.2	21.0	551.1	26.0	712.7	16.7	17.8	26.2	27.4
Rakvere Hospital	22.0	353.0	43.0	894.0	1.0	19.4	16.0	439.0	16.0	20.8	19.4	27.4
South-Estonian Hospital	55.0	557.3	33.0	536.3	16.0	425.2	12.0	282.0	10.1	16.3	26.6	23.5
Viljandi Hospital	98.0	1,199.0	145.0	2,133.8	68.0	531.0	34.0	804.4	12.2	14.7	7.8	23.7
General Hospitals 2	94.0	875.1	93.0	1,158.7	39.0	538.3	77.0	1,914.3	9.3	12.5	13.8	24.9
Hiumaa Hospital	7.0	100.0	14.0	292.0					14.3	20.9		
Järvamaa Hospital	14.0		11.0		7.0		8.0					
Jõgeva Hospital	28.0	432.9	9.0	145.0	6.0	172.8	30.0	1,017.6	15.5	16.1	28.8	33.9
Läänemaa Hospital	14.0	80.5	33.0	358.3	0.0	0.0	12.0	437.8	5.8	10.9		36.5
Põlva Hospital	10.0		10.0		10.0		14.0					
Raplamaa Hospital	7.0	66.3	6.0	82.9	14.0	298.0	3.0	100.2	9.5	13.8	21.3	33.4
Valga Hospital	14.0	195.4	10.0	280.5	2.0	67.5	10.0	358.7	14.0	28.1	33.8	35.9
Other type of hospitals	7.0	86.1	76.0	1,316.0	9.0	223.0	18.0	589.0	38.1	17.3	24.8	32.7
Elva Hospital	0.0	0.0	27.0	426.6	0.0	0.0	9.0	302.4		15.8		33.6
Fertilitas	2.0	34.4	13.0	223.6	0.0	0.0	2.0	64.0	17.2	17.2		32.0
Haapsalu Neurological Rehabilitation Centre (HNRC)	2.0	22.0	33.0	624.2	9.0	223.0	4.0	135.2	11.0	18.9	24.8	33.8
Hospital of Reconstructive Surgery	3.0	29.7	3.0	41.6			3.0	87.4	9.9	13.9		29.1
Grand total	1,048.0	13,805.1	1,217.0	21,991.6	430.0	9,237.6	420.0	12,132.4	13.2	18.1	21.5	28.9

Figure 31 Share of single, double, triple and quadruple patient rooms



The utility systems were assessed by each hospital own technicians based on a the author's designed uniform rating scale: hospital building age and major and/or partial renovation in the last 20 years, the type and status of the building main structure, condition of structural elements and technical systems (doors and windows, roofs, floors, lifts, heating system, water supply system and electrical supply system and security of electrical supply).

The score of 180 or over was awarded to new or fully renovated hospital buildings or hospital buildings with renovation process the final stage. These include Valga Hospital, Pärnu Hospital, Fertilitas and Läänemaa Hospital. Hospitals with buildings renovated partially and/or is still in planning or initial stage and/or renovation was carried out more than 20 years ago generally were evaluated at 160–180 score (WTCH, HNRC, Narva Hospital, Raplamaa Hospital). The rest of the hospitals were with the score 115 to 156 points (Annex 5, Table 15).

Figure 32 Assessment of technical condition of hospitals' infrastructure in rating points

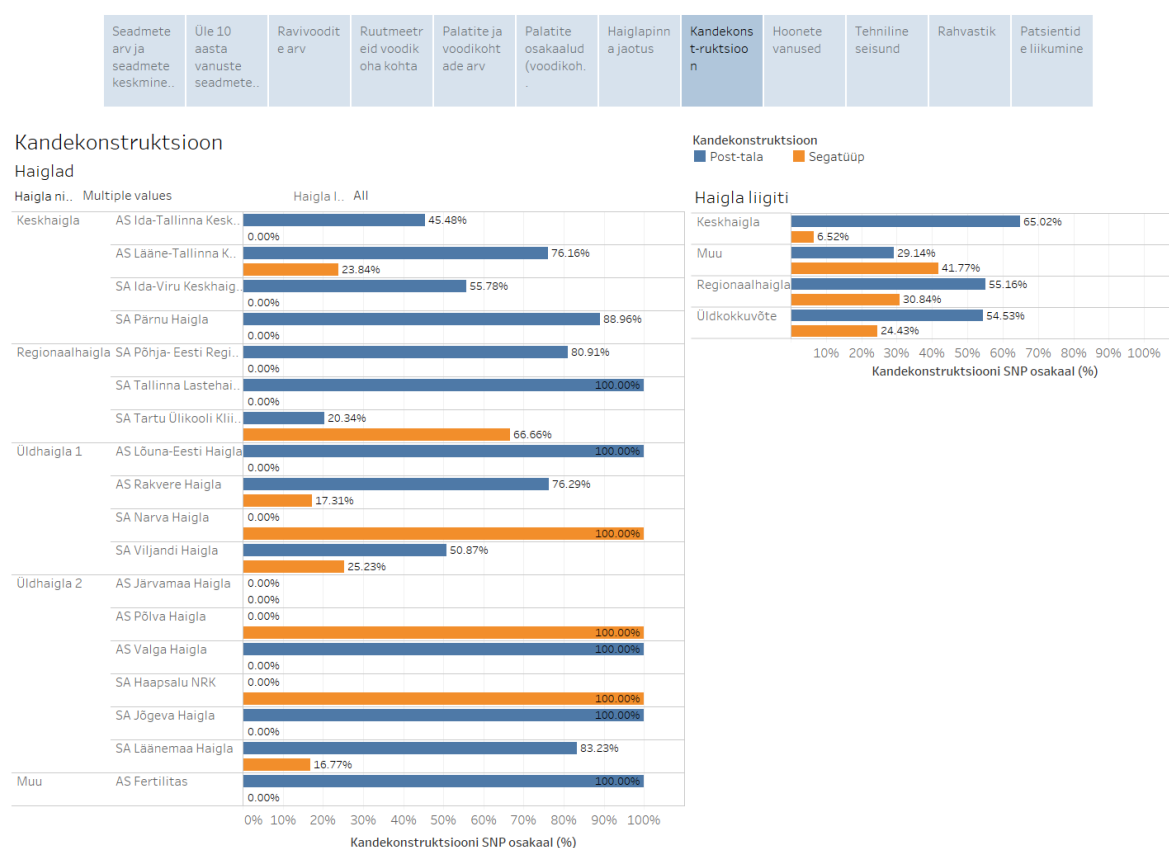


55% (389,000 m²) of GIA of hospital buildings have a post and beam structure, 25% (175,000 m²) mixed-type and the rest with load-bearing interior wall technology. The floor to ceiling height panel operating blocks, level 3 IC departments and radiology departments was in average 3–4 m; in patient rooms 2,5–3 m. (Table 9)

Table 9 Type of hospital building structure

Type of hospital	Total gross internal area (GIA)	Load-bearing walls structure	Share of load-bearing walls structure	Column-beam structure	Share of column-beam structure	Mixed construction structure	Share of mixed construction structure
Regional Hospitals	294,454	41,206	14%	162,424	55%	90,824	31%
North Estonia Medical Centre	123,086	23,492	19%	99,594	81%	0	0%
Tallinn Children's Hospital	35,124	0	0%	35,124	100%	0	0%
Tartu University Hospital	136,244	17,714	13%	27,706	20%	90,824	67%
Central Hospitals	201,147	57,253	28%	130,784	65%	13,110	7%
East-Tallinn Central Hospital	67,908	36,885	54%	30,881	45%	141	0%
East-Viru Central Hospital	35,144	15,542	44%	19,602	56%	0	0%
Pärnu Hospital	43,689	4,825	11%	38,864	89%	0	0%
West-Tallinn Central Hospital	54,406	0	0%	41,436	76%	12,969	24%
General Hospitals	198,828	45,318	23%	89,839	45%	63,672	32%
General Hospitals 1	129,816	29,662	23%	51,138	39%	49,015	38%
Kuessaare Hospital	20,216	20,216	100%	0	0	0	0%
Narva Hospital	35,291	0	0%	0	0%	35,291	100%
Rakvere Hospital	17,024	1,090	6%	12,987	76%	2,947	17%
South-Estonian Hospital	18,339	0	0%	18,339	100%	0	0%
Viljandi Hospital	38,946	8,356	21%	19,813	51%	10,777	37%
General Hospitals 2	69,013	15,656	23%	38,700	56%	14,657	21%
Hiumaa Hospital	2,556	2,556	100%	0	0%	0	0%
Järvamaa Hospital	8,153	7,973	98%	180	2%	0	0%
Jõgeva Hospital	15,381	0	0%	15,381	100%	0	0%
Läänemaa Hospital	9,510	0	0%	7,915	83%	1,595	17%
Põlva Hospital	13,062	0	0%	0	0%	13,062	100%
Raplamaa Hospital	5,127	5,127	100%	0	0%	0	0%
Valga Hospital	15,224	0	0%	15,224	100%	0	0%
Other type of hospitals	17,352	3,518	20%	6,586	38%	7,248	42%
Elva Hospital	3,518	3,518	100%	0	0%	0	0%
Fertitas	5,056	0	0%	5,056	100%	0	0%
Haapsalu Neurological Rehabilitation Centre (HNRC)	7,248	0	0%	0	0%	7,248	100%
Hospital of Reconstructive Surgery	1,530	0	0%	1,530	100%	0	0%
Grand total	711,781	147,296	21%	389,632	55%	174,853	25%

Figure 33 Type of hospital building structure



4.2.5 Assessment of the compactness of Estonian hospitals' medical campuses

One criterion to assess patient-centredness is the compactness of a hospital campus and the distance and patient logistics between separate buildings. Our conducted survey indicated that 117 hospital buildings are at separate registered addresses and 66 of them locate more than one kilometre from the hospital's main campus (Annex 5, Table 16).

4.2.6 Environmental impact of hospital construction

The environmental impact assessment of the planning area is always based on the location of the hospital (object)³⁰ and in the process the assessor must follow certain rules³¹.

If necessary, an ex-ante environmental impact assessment has to be conducted to provide for the decision-makers (the municipality responsible for the planning of residential areas and/or

³⁰ Regulation No 224 of the Estonian Government "A list of areas of activity for which an ex ante assessment of the necessity of an environmental impact assessment is to be carried out" established on the basis of Subsection 6(4) of the "Environmental Impact Assessment and Environmental Management System Act". Paragraph 13 of that regulation provides that ex ante assessment of the necessity of an environmental impact assessment must be carried out in respect of the following activities in the field of infrastructure construction, which include the development of a hospital project under paragraph 2.

³¹ An ex ante (preliminary) assessment of the environmental impact of the planning area must be carried out in accordance with the procedure established in the Republic of Estonia and the European Commission's guidelines "Guidance on EIA, Screening". The assessor shall also, where appropriate, be guided by 'Assessment of plans and projects with a significant impact on Natura 2000 sites' and Article 6(3) of Council Directive 92/43/EEC on the protection of natural habitats and wild flora and fauna.

other planned areas) with sufficient information on the significant negative and positive environmental impacts, in order for them to be able to decide whether or not to carry out a more thorough environmental impact assessment.

During the preparation of an ex ante environmental assessment:

- The parties involved in planning shall be mapped,
- An overview of the location of the hospital and the activities planned there is provided,
- An assessment of the compliance of the hospital's location with strategic planning documents shall be made
- An ex ante assessment shall be given of the environmental conditions of the planning area and the important environmental aspects
 - The geological and hydrological situation of the planning area and the impact of the construction of the hospital on it
 - Protected natural objects located in the planning area
 - The impact of the plan on the Natura 2000 network
 - The impact of the plan on existing vegetation
 - The impact of the plan on existing fauna
 - The impact on noise and vibration levels and air quality resulting from the plan
 - Waste generation arising from the plan
 - Socio-economic effects arising from the plan (including on human health, well-being and property)
 - Impact of the plan on heritage sites

In accordance with the regulation³² an ex ante environmental impact checklist of environmental impacts is produced, which brings together various aspects that may occur in proposed implementation, helping users to decide whether an environmental impact assessment is necessary. On the basis of an ex-ante environmental impact assessment a decision will be made on the need for a further strategic environmental impact assessment. During the last decades no need for strategic environmental impact assessments in developing new hospital buildings has been considered necessary.

4.2.7 Regional hospitals infrastructure

The total GIA of three regional hospitals comprise 41% (294,000 m²) of total Estonian hospital gross internal area of which 50% (146,000 m²) was either built or capitally renovated in the last 20 years, and (15,000m²) partially renovated (Annex 5, Table 13). 39% of the total GIA (114,000 m²) has automatic indoor climate control, 16% are older than 50 years, while the 33% is between 31–50 years and 50% is built in the last 20 years (Tables 5, 10)

Regional hospitals have 2560 licensed beds (36% of total beds in Estonia) of which as of June 2020 was in use 2457 beds, compared to NHID 2018 data based 1848 actually used beds (72% of licenced beds). The total floorspace per licenced bed is 115 m² and per actually used bed 159 m². (Table 4).

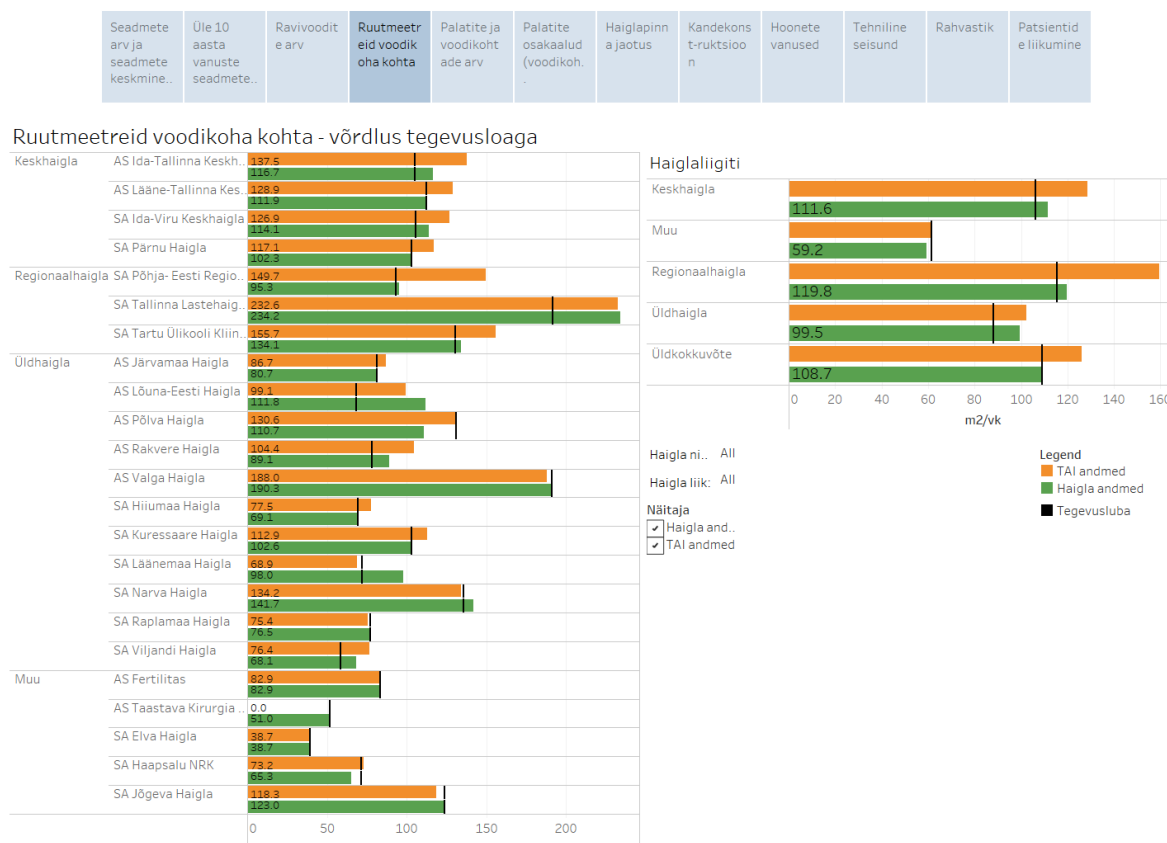
³² Republic of Estonia and the European Commission's Guide "Guidance on EIA, Screening"

Table 10 Type of buildings ventilation system

Type of hospital	Total gross internal area (GIA)	Automatical climate control	Share of automatical climate control
Regional Hospitals	294,454	114,150	39%
North Estonia Medical Centre	123,086	49,715	40%
Tallinn Children's Hospital	35,124		
Tartu University Hospital	136,244	64,435	47%
Central Hospitals	201,147	73,891	37%
East-Tallinn Central Hospital	67,908		
East-Viru Central Hospital	35,144	19,602	56%
Pärnu Hospital	43,689	16,631	38%
West-Tallinn Central Hospital	54,406	37,658	69%
General Hospitals	198,828	33,756	17%
General Hospitals 1	129,816	13,972	11%
Kuressaare Hospital	20,216		
Narva Hospital	35,291		
Rakvere Hospital	17,024	777	5%
South-Estonian Hospital	18,339		
Viljandi Hospital	38,946	13,196	34%
General Hospitals 2	69,013	19,784	29%
Hiiumaa Hospital	2,556		
Järvamaa Hospital	8,153		
Jõgeva Hospital	15,381		
Läänemaa Hospital	9,510	1,595	17%
Põlva Hospital	13,062	13,062	100%
Raplamaa Hospital	5,127	5,127	100%
Valga Hospital	15,224		
Other type of hospitals	17,352	12,304	71%
Elva Hospital	3,518		
Fertilitas	5,056	5,056	100%
Haapsalu Neurological Rehabilitation Centre (HNRC)	7,248	7,248	100%
Hospital of Reconstructive Surgery	1,530		
Grand total	711,781	234,102	33%

Regional hospitals have 35% of all patient rooms in Estonian hospitals (1095 ordinary patient rooms with 2322 beds), 83% of these have with O₂ connection, 69% are one and two bed rooms with 48% of all ordinary beds, and only 83% of the single and double patient rooms are WC and shower equipped. The rest of the patient rooms are 3–4 bed rooms of which only 17% have a WC and shower. An average outpatient reception room has 19m² of area and operating rooms 43m² (Table 6, 8).

Figure 34 Beds/floorspace standard according to activity licence (m² per bed), floorspace standard according to actual use (m² per bed)



Our hospital rating methodology scored TCH with 154 and both NEMC and TCH with 146. The as only 50% of the regional hospital floor area infrastructure has been build or renovated in the last 20 years (Annex 5, Table 5).

55% of the load-bearing structures of regional hospitals (162,000 m²) are a post-beam and 31% (91,000 m²) mixed-type. The floor height in operating theatres, level 3 IC and radiology departments of TCH and NEMC is 3–4 m and in TCH less than 3m, in patient room the height is in average 2,5–3 m.

In total, 27 hospital buildings of regional hospitals are located at separate addresses of which 19 buildings far from a specific the hospital's main campus. Eight of TCH buildings are forming the main campus of the hospital. TCH buildings are located at two campuses NEMC has buildings 17 at 16 campuses.

4.2.8 Central hospitals infrastructure

Central hospitals consist 28% (201,000 m²) of Estonian total hospital GIA of which 47% (95,000 m²) has been either fully or in major part renovated during the last 20 years. Of this 37% (74,000 m²) has automatic climate control and 14% is older than 50 years, 34% of between 31–50 years and 47% was built in the last 20 years.

Central hospitals have 1898 licenced beds (27% all of Estonian hospital), while 1803 beds were actually used as of June 2020. Our cross check based on the NIHD's 2018 data gives

1566 beds (82% of licenced beds). The total floorspace per licenced bed is 106 m² and per actual used bed 128 m² (Table 4).

28% of all patient rooms in Estonian hospitals are in central hospitals (879 ordinary patient rooms with 1617 beds). Of these beds 58% are with O₂ supply, 83% are in 1 and 2-bed patient rooms that include 69% of all ordinary beds and 74% have a WC and shower. 13% of 3 to 4 bed patient rooms have a WC and shower. Outpatient rooms are in average 17 m² of area and operating theatres 36 m² (Table 6, 8).

All but one of central hospitals were rated over 160 infrastructure technical score, respectively, except for ETCH that reached to 123. Only 47% of the total central hospital infrastructure has been already fully renovated (Annex 5, Table 13.) 65% (131,000 m²) of the load-bearing structures of central hospital buildings has a post and beam structure and 7% (13,000 m²) a mixed-type one. The height of operating block, level 3 IC and radiology department premises is 3–3,5 and patient room departments 3–3,5 m.

38 of buildings hospital are locating at separate addresses and 23 of these are far from the hospital's main campus. Pärnu Hospital is locating at two addresses, WTCH have nine addresses for six separate campuses, IVCH is at 13 addresses with seven campuses and ETCH at 14 addresses in eight campuses.

4.2.9 General hospitals infrastructure

Eleven general hospitals and one local hospital occupy in total 28% (199 000 m²) of the total Estonian hospital GIA of which 32% (64,000 m²) was substantially renovation in the last 20 year, while 13% (27,000 m²) has undergone partial renovation; 17% (34,000 m²) is equipped with automatic climate control. 11% of the GIAs older than 50 years (in general hospitals Group 1 - 16% and in general hospitals Group 2 - 4%), 40% between 31-50 years and 41% has been built in the last 20 years.

All general hospitals have in total 2264 beds (32% of total licenced beds in Estonian), of which 1998 were actually in use as of 2020 vs. 1944 beds based on NIHD's 2018 average number of activity treatment beds in use data (86% of licenced beds). The total floorspace per licenced bed is 88 m² (in general hospital group 1 – 80 m² and in general hospital group 2 – 107 m²) and per actually used bed 102 m² in 2018 (Table 4).

General hospitals have 33% of all patient rooms of all Estonian hospitals (1031 ordinary patient rooms with 2255 beds), 48% of the beds were equipped with an O₂, 68% are one or two bed rooms that accommodate of 49% all ordinary beds. Only 48% of the single and double patient rooms are equipped with a WC and shower. 15% of all larger patient rooms (3 to 4 beds) have a WC and shower. The average floorspace of outpatient rooms is 18 m² (in general hospital Group 1 - 19 m² and in general hospital Group 2 – 17 m²) and that of operating rooms is 34 m² (in general hospital Group 1 – 33 m² and in general hospital Group 2 – 37 m²) (Table 6, 8). In most cases, except Valga, Narva and Raplamaa hospitals, the assessment of technical condition was less than 160 points as because only 41% of the infrastructure has been fully or partially renovated. (Annex 5, Table 5). 45% (90,000 m²) of load-bearing structures are of post and beam structure, 32% (64,000 m²) and are mixed-type. The floor height in operating blocks, level 3 IC and radiology departments is in average 3–3,5 m and in patient rooms 2,5–3 m.

The 11 general hospitals and one local hospital have altogether 48 buildings located at separate addresses; 20 hospital buildings are located far from the hospital's main campus. SEH, Kuressaare Hospital, Põlva Hospital, Valga Hospital, Hiiumaa Hospital, Jõgeva Hospital, Raplamaa Hospital are located at a single building, Rakvere Hospital at five addresses with two separate campuses (four hospital buildings in one location and one building separately), Narva Hospital is at seven addresses with three separate campuses (five hospital buildings in one location and two buildings separately), Viljandi Hospital is at 18 addresses and three separate campuses, Järvamaa Hospital at seven addresses and three campuses, and Läänemaa Hospital at two addresses as a single building campus.

4.2.10 Major imaging diagnostics and radiotherapy equipment

As of June 2020, all surveyed hospitals had 77 stationary radiography and fluoroscopy systems (incl. 12 mammographs), 11 angiographs, 25 computerised axial tomography machines (CAT), 16 magnetic resonance imaging (MRI) machines, 3 positron emission tomography units (PET), 3 gamma cameras (SPECT), 6 linear accelerators and 2 brachytherapy machines (Annex 5, Table 17). If these numbers are adjusted to 100 000 population, Estonia is positioned among average in EU comparison (Table 11).

Table 11 Availability of medical technology — imaging and treatment equipment

CC3:Q40	Angio- graphy units	Computed tomography (CT) scanners	Magnetic resonance imaging (MRI) units	Gamma cameras	Mammo- graphy units	PET scanners	Radiation therapy equipment	Angio- graphy units	Computed tomography (CT) scanners	Magnetic resonance imaging (MRI) units	Gamma cameras	Mammo- graphy units	PET scanners	Radiation therapy equipment
	2015	2017						2015	2017					
		(number)							(per 100 000 inhabitants)					
Belgium ⁽¹⁾	127	262	132	292	203	30	209	1.1	2.3	1.2	2.6	1.8	0.3	1.8
Bulgaria	80	253	70	20	219	7	67	1.1	3.6	1.0	0.3	3.1	0.1	1.0
Czechia	91	167	100	121	120	17	87	0.9	1.6	0.9	1.1	1.1	0.2	0.8
Denmark	:	229	:	94	92	42	73	:	4.0	:	1.6	1.6	0.7	1.3
Germany ⁽²⁾	876	2,904	2,869	518	:	126	422	1.1	3.5	3.5	0.6	:	0.2	0.5
Estonia	7	24	18	3	16	3	7	0.5	1.8	1.4	0.2	1.2	0.2	0.5
Ireland	:	92	73	28	77	9	57	:	1.9	1.5	0.6	1.6	0.2	1.2
Greece ⁽³⁾	120	368	285	135	608	12	68	1.1	3.4	2.7	1.3	5.7	0.1	0.6
Spain	267	866	760	294	751	80	231	0.6	1.9	1.6	0.6	1.6	0.2	0.5
France ⁽⁴⁾	463	1,161	950	466	467	147	721	0.7	1.7	1.4	0.7	0.7	0.2	1.1
Croatia	66	74	46	29	140	5	23	1.6	1.8	1.1	0.7	3.4	0.1	0.6
Italy	834	2,101	1,732	492	2,038	202	459	1.4	3.5	2.9	0.8	3.4	0.3	0.8
Cyprus	7	29	18	10	48	1	7	0.8	3.4	2.1	1.2	5.6	0.1	0.8
Latvia	11	76	27	7	51	0	10	0.6	3.9	1.4	0.4	2.6	0.0	0.5
Lithuania ⁽⁵⁾	25	66	35	8	45	2	21	0.9	2.3	1.2	0.3	1.6	0.1	0.7
Luxembourg	9	10	7	7	7	1	5	1.6	1.7	1.2	1.2	1.2	0.2	0.8
Hungary	56	90	46	114	150	9	46	0.6	0.9	0.5	1.2	1.5	0.1	0.5
Malta	4	9	5	2	16	2	4	0.9	1.9	1.1	0.4	3.4	0.4	0.9
Netherlands	:	231	223	133	:	73	:	:	1.4	1.3	0.8	:	0.4	:
Austria	:	252	202	93	192	24	47	:	2.9	2.3	1.1	2.2	0.3	0.5
Poland	468	641	301	149	364	24	173	1.2	1.7	0.8	0.4	1.0	0.1	0.5
Portugal ⁽¹⁾	109	245	85	31	121	8	45	1.1	2.4	0.8	0.3	1.2	0.1	0.4
Romania	71	274	140	45	159	8	84	0.4	1.4	0.7	0.2	0.8	0.0	0.4
Slovenia	17	31	24	17	33	3	13	0.8	1.5	1.2	0.8	1.6	0.2	0.6
Slovakia	47	94	52	30	104	8	63	0.9	1.7	1.0	0.6	1.9	0.2	1.2
Finland ⁽⁶⁾	84	135	149	48	168	16	55	1.5	2.5	2.7	0.9	3.1	0.3	1.0
Sweden ⁽¹⁾	125	186	141	74	137	16	71	1.3	1.9	1.4	0.7	1.4	0.2	0.7
United Kingdom ⁽⁷⁾	:	611	467	:	:	:	536	:	1.0	0.7	:	:	:	0.8
Iceland	7	15	7	3	6	0	3	2.1	4.4	2.0	0.9	1.8	0.0	0.9
Liechtenstein	1	1	1	0	0	0	0	2.7	2.6	2.6	0.0	0.0	0.0	0.0
Switzerland ⁽⁸⁾	247	332	197	62	243	28	141	3.0	3.9	2.3	0.7	2.9	0.3	1.7
Serbia	24	74	24	21	125	2	26	0.3	1.1	0.3	0.3	1.8	0.0	0.4
Turkey	406	1,186	884	283	947	121	223	0.5	1.5	1.1	0.4	1.2	0.2	0.3

⁽¹⁾ Hospitals only.⁽²⁾ Gamma cameras, angiography units and PET scanners: hospitals only.⁽³⁾ Angiography units: 2013.⁽⁴⁾ Mammography and angiography units: hospitals only.⁽⁵⁾ Angiography units: includes also non-digital units.⁽⁶⁾ Gamma cameras: 2015.⁽⁷⁾ 2014.⁽⁸⁾ Angiography units: 2014. Magnetic resonance imaging units and gamma cameras: hospitals only. Computed tomography scanners and magnetic resonance imaging units: data refer to the number of hospitals running at least one unit (rather than the number of units).

Source: Eurostat (online data code: hlth_rs_equip)

In total, 48% of X-ray units, 55% of angiographs, 20% of CT-ss, 44% of MRI-s, 33% of PET-s, 33% of LINAC-s and 50% of brachytherapy machines were older than 10 years (see Figure 35 below).

Figure 35 Information on the number and age of surveyed equipment by individual hospitals, hospital type group and age (than 10-years health map) in 2019

Seadmete arv ja seadmete keskmine...	Üle 10 aasta vanuste seadmete...	Ravivoodide arv	Ruutmeetrid voodikoha kohta	Palatite ja voodikohade arv	Palatite osakaal (voodikoh.	Haiglapinna jaotus	Kandekonsultantsioon	Hoonete vanused	Tehniline seisund	Rahvastik	Patsientide liikumine
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Üle 10 aasta vanuste seadmete osakaal

	Radiograafia ja fl.	Angiograafia	Brahühüteraapia	KT	LINAC	Mammograafia	MRT	PET	SPECT
Keskhaigla									
AS Ida-Tallinna Keskhaigla	40.0% (2/5)	100.0% (1/1)	0.0% (0/0)	50.0% (1/2)	0.0% (0/0)	0.0% (0/2)	66.7% (2/3)	100.0% (1/1)	0.0% (0/0)
AS Lääne-Tallinna Keskhaigla	0.0% (0/5)	0.0% (0/0)	0.0% (0/0)	0.0% (0/2)	0.0% (0/0)	0.0% (0/0)	50.0% (1/2)	0.0% (0/0)	0.0% (0/0)
SA Ida-Viru Keskhaigla	60.0% (6/10)	100.0% (1/1)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	100.0% (1/1)	100.0% (1/1)	0.0% (0/0)	0.0% (0/0)
SA Pärnu Haigla	0.0% (0/2)	0.0% (0/1)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/1)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)
Regionaalhaigla									
SA Põhja-Eesti Regionaalhaigla	100.0% (6/6)	60.0% (3/5)	0.0% (0/1)	50.0% (2/4)	50.0% (2/4)	50.0% (1/2)	66.7% (2/3)	0.0% (0/1)	0.0% (0/0)
SA Tallinna Lastehaigla	25.0% (2/8)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
Tartu Ülikooli Kliinikum	50.0% (4/8)	33.3% (1/3)	100.0% (1/1)	25.0% (1/4)	0.0% (0/2)	25.0% (1/4)	25.0% (1/4)	0.0% (0/1)	0.0% (0/0)
Üldhaigla									
AS Järvamaa Haigla	75.0% (3/4)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
AS Lõuna-Eesti Haigla	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)
AS Põlva Haigla	0.0% (0/2)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
AS Rakvere Haigla	66.7% (2/3)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
AS Valga Haigla	50.0% (1/2)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Hiiumaa Haigla	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Kuressaare Haigla	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Läänemaa Haigla	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Narva Haigla	66.7% (4/6)	0.0% (0/0)	0.0% (0/0)	100.0% (1/1)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Raplamaa Haigla	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Viljandi Haigla	33.3% (1/3)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)
Muu									
AS Fertiitas	100.0% (3/3)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
AS Taastava Kirurgia Kliinikum	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Elva Haigla	100.0% (1/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
SA Haapsalu NRK	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
Keskhaigla	34.8% (8/23)	66.7% (2/3)	0.0% (0/0)	16.7% (1/6)	0.0% (0/0)	25.0% (1/4)	57.1% (4/7)	100.0% (1/1)	0.0% (0/1)
Muu	85.7% (6/7)	0.0% (0/0)	0.0% (0/0)	0.0% (0/1)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)	0.0% (0/0)
Regionaalhaigla	54.5% (12/22)	50.0% (4/8)	50.0% (1/2)	37.5% (3/8)	33.3% (2/6)	33.3% (2/6)	42.9% (3/7)	0.0% (0/2)	0.0% (0/2)
Üldhaigla	44.0% (11/25)	0.0% (0/0)	0.0% (0/0)	10.0% (1/10)	0.0% (0/0)	0.0% (0/2)	0.0% (0/2)	0.0% (0/0)	0.0% (0/0)
Üldkokkuvõte	48.1% (37/77)	54.5% (6/11)	50.0% (1/2)	20.0% (5/25)	33.3% (2/6)	25.0% (3/12)	43.8% (7/16)	33.3% (1/3)	0.0% (0/3)

In our mapping we have collected and analysed information on usage of major equipment in according the type hospitals (see details in Annex 5, Table 12, 18; Figure 40). The workload of CT and MRT equipment in general hospitals is similar to the workload of the corresponding equipment in regional and central hospitals, while the workload of an average X-ray equipment in general hospital is two or more times lower than in regional or central hospitals. As an X-ray equipment's average workload in regional and central hospitals is close to technologically optimal capacity, X-ray units in general hospitals are used about 30%-50% of their effective capacity.

The annual average workload of CT, MRT and PET units in regional and central hospitals in Estonia are in general terms comparable with other European countries. In 2017, the most intensive workload of CT scanners (as measured by the average number of scans per machine) is recorded in France, Luxembourg and Hungary, more than 10 000 scans per unit annually, and the least intensive use of CT scanner units was recorded in Bulgaria and Finland, where the average was less than 2000 scans per unit annually. In Estonia, an average CT scanner performed 9528 scans. An MRI scanner in Estonia performed in average 5188 scans per 100,000 population in 2017. In Europe, the highest number of MRI scans per 100,000 population were recorded in Germany (2016 data) and France, 14,344 and 11,411 respectively, while for example the number in Denmark was 8,696 and the lowest amount of scans per unit was recorded in Cyprus (660 MRI scans per 100,000 inhabitants) (Table 12).

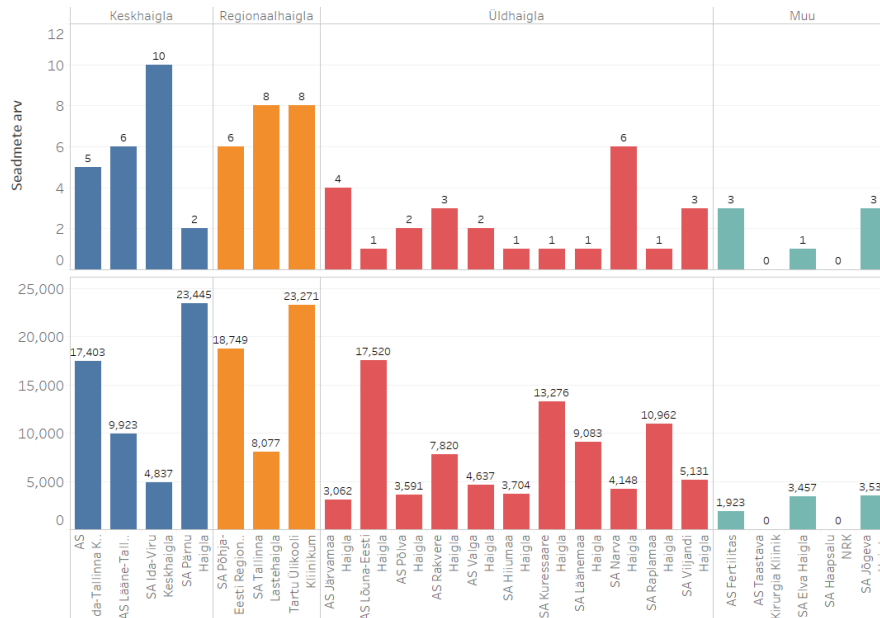
Figure 36 Distribution and workload x-ray equipment in 2019

Seadmete arv ja seadmete keskmine...	Üle 10 aasta vanuste seadmete...	Ravivoodite arv	Ruutmeetrid voodikohta kohta	Palatite ja voodikohtade arv	Palatite osakaalud (voodikoh...	Haiglapinna jaotus	Kandekonsultantsioon	Hoonete vanused	Tehniline seisund	Rahvastik	Patsientide liikumine
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Seadmete arv ja seadmete keskmine ko... Seade
Radiograafia ja fluoroskoop...

Haiglad

Haigla ni... All



Haigla liigiti

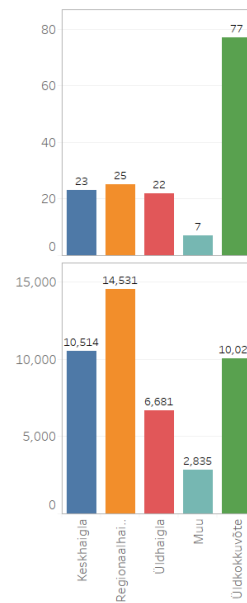


Table 12 Use of imaging equipment, 2017

	Computed tomography (CT) scanners	Magnetic resonance imaging (MRI) units	PET scanners	Computed tomography (CT) scanners	Magnetic resonance imaging (MRI) units	PET scanners	Computed tomography (CT) scanners	Magnetic resonance imaging (MRI) units	PET scanners
	(number of scans)			(number of scans per 100 000 inhabitants)			(number of scans per machine)		
Belgium	2,281,227	1,068,596	107,836	20,054	9,394	948	:	:	:
Bulgaria	465,227	71,603	14,287	6,575	1,012	202	1,839	1,023	2,041
Czechia	1,097,052	558,236	49,163	10,355	5,269	464	6,569	5,582	2,892
Denmark	996,384	501,314	51,415	17,283	8,696	892	4,351	:	1,224
Germany ⁽¹⁾	12,225,017	11,812,067	140,800	14,845	14,344	170	4,221	4,159	408
Estonia	222,195	68,349	1,236	16,866	5,188	94	9,258	3,797	412
Ireland	:	:	:	:	:	:	:	:	:
Greece ⁽²⁾	1,620,000	690,000	11,500	15,033	6,403	107	4,186	2,379	885
Spain	5,355,681	4,102,449	173,375	11,495	8,805	372	6,184	5,398	2,167
France	12,686,590	7,629,774	499,729	18,973	11,411	747	10,927	8,031	3,400
Croatia	383,058	193,979	9,326	9,275	4,697	226	5,176	4,217	1,865
Italy	5,441,378	4,320,134	317,640	8,989	7,136	525	2,590	2,494	1,572
Cyprus	121,510	5,673	0	14,137	660	0	4,190	315	–
Latvia	333,946	107,502	:	17,194	5,535	:	4,394	3,982	:
Lithuania	287,806	141,669	1,453	10,176	5,009	51	4,361	4,048	727
Luxembourg	113,120	43,293	2,643	18,969	7,260	443	11,312	6,185	2,643
Hungary	1,199,014	433,309	20,491	12,250	4,427	209	13,322	9,420	2,277
Malta	40,722	24,985	1,780	8,701	5,339	380	4,525	4,997	890
Netherlands	1,609,525	875,445	101,499	9,395	5,110	592	6,968	3,926	1,390
Austria ⁽³⁾	1,316,454	534,248	40,085	14,964	6,073	456	8,548	5,452	2,004
Poland	3,683,844	1,376,815	58,616	9,701	3,626	154	5,747	4,574	2,442
Portugal ⁽³⁾	1,946,114	451,142	15,366	18,894	4,380	149	7,943	5,308	1,921
Romania ⁽¹⁾	539,358	213,408	6,203	2,738	1,083	32	2,166	1,840	775
Slovenia	146,478	127,641	25	7,089	6,177	1	4,725	5,318	8
Slovakia	837,104	342,443	10,435	15,390	6,296	192	8,905	6,585	1,304
Finland	244,092	237,273	3,071	4,431	4,308	56	1,808	1,592	192
Sweden	:	:	:	:	:	:	:	:	:
United Kingdom ⁽³⁾	6,097,719	4,104,277	:	9,231	6,213	:	:	:	:
Iceland	73,399	31,231	:	21,374	9,095	:	4,893	4,462	:
Liechtenstein	1,458	3,496	0	3,841	9,209	0	1,458	3,496	–
Switzerland ⁽³⁾ (*)	928,960	626,538	45,165	10,991	7,413	534	4,403	3,180	1,613
North Macedonia	63,476	21,868	363	3,060	1,054	18	:	:	–
Serbia	342,529	94,331	2,967	4,879	1,344	42	4,629	3,930	1,484
Turkey	16,596,013	:	255,197	20,664	:	318	13,993	:	2,109

(¹) Computed tomography scanners and magnetic resonance imaging units: 2016. Number of scans per PET scanner: hospitals only.

(²) 2016.

(³) Hospitals only.

Source: Eurostat (online data codes: hlth_co_exam and hlth_rs equip)

Analysis and summary

According to the Estonian Hospital Master Plan 2015 (EHMP2015)³³ developed by Scandinavian Care Consultants AB and SWECO International AB in 2000, Estonia was divided into four main central or regional hospital catchment areas. New hospital network system for secondary and tertiary care was proposed to be implemented during 10–15 years with the number of acute care hospitals reduced from 27 to 13. Also, hospital standard was meant to be improved. In 2000 gross area per bed varied from 18 m². in Tartu nursing hospital to 113 m² in Pärnu Hospital (under planning at the time of completing the report). Even in Tartu University Hospital the gross area per bed was 50–70 m². In Sweden modern hospitals in 2000 had 150–190 m². gross area per bed, in Denmark 150m².

³³ <http://rahvatervis.ut.ee/handle/1/2049>

Table 13 Recommended area standard for gross bed area in 2000 (Source: Estonian Hospital Network Development Plan 2015).

Hospital	New construction (sqm per bed)	Reconstructed hospital (sqm per bed)
University hospital	130	120
Regional hospital	130	120
Central hospital	120	110
General hospital	100	90
Long-term and rehabilitation hospital	90	80
Nursing home	80	70

Table 14 Some examples from European hospitals on total floor area pe bed

	Bed capacity	Total Area (m ²)	m ² /bed
Vienna North Hospital, Austria ³⁴	800	215 000	270
North Zealand Hospital, Denmark ³⁵	570	112 500	197
Charleroi Teaching Hospital, Belgium ³⁶	570	85 000	150
Mestre Hospital, Italy ³⁷	680	96 425	142
Clermont-Ferrand Hospital, France ³⁸	565	70 000	124
Lens Hospital, France ³⁹	600	72 000	120
Krakow University Hospital, Poland ⁴⁰	925	110 000	119
Rivera Hospital, Romania ⁴¹	230	30 000	130

Regional hospitals (North Estonia Medical Centre, Tallinn Children's Hospital, Tartu University Hospital)

- In general, the objectives for regional hospital set in EHMP2015 have been mostly

³⁴ <https://www.e-architect.co.uk/vienna/krankenhaus-nord-wien>

³⁵ <https://www.regionh.dk/nythospitalnordsjaelland/english/Facts/Sider/Welcome%20to%20New%20North%20Zealand%20Hospital.aspx>

³⁶ <http://www.artbuild.eu/projects/healthcare-and-laboratories/hospital-charleroi>

³⁷ <https://www.e-architect.co.uk/italy/new-mestre-hospital>

³⁸ <http://groupe-6.com/wp-content/uploads/2017/02/groupe-6-press-pack-clermont-engl.pdf>

³⁹ <http://www.ch-lens.fr/mini-sites/nouvel-hopital-de-lens/le-projet/>

⁴⁰ Personal communication: Redin Tanior Abduraman, redin@omb.ro

⁴¹ Personal communication: Redin Tanior Abduraman, redin@omb.ro

implemented and there is no explicit need for revisiting the goals, and existing room standards are meeting modern standards or the hospitals are working on this (recommended gross area standard per bed 150–190 m².)

- The real gross area standard per licensed bed according in TCH is 191 m² and the gross area per bed actually in use is 233 m². This might indicate to some inefficiencies and need to be investigated in more detail.
- The proportion of single and double-bed patient rooms in NEMC (app. 50%) is lower than in other two regional hospitals (over 80%).

Central hospitals (ETCH, WTCH, IVCH, Pärnu Hospital)

- All central hospitals have optimal catchment area size for their effective functioning with adequate workload for securing service quality and implementation of the aims set by EHMP2015 are mostly met or under way. Adequate and sufficient workload for central hospitals to ensure the quality of the service means, above all, a workload sufficient to burden large medical teams throughout the year in all medical specialities practiced in the hospitals.
- Pärnu Hospital has realized about 90%, IVCH about 30% and WTCH about 40% of its infrastructure modernization program a significant part of hospital space fully or partly renovated.
- The problem remains in Tallinn where the buildings of ETCH and WTCH are outdated, scattered in several campuses and do not support efficient modern functional workflow.
- The average gross area standard per licenced bed of central hospitals is 106 sq.m. and per actual bed usage 128 m², which is insufficient considering future developments in service delivery and training of medical personnel.

General hospitals

- Due to demographic changes and migration, total catchment population of general hospitals has decreased by about 131,000 (about 27%) people since 1990. In counties where the hospitals of general hospitals Group 1 are located, the total catchment population has decreased by app. 57,000 (about 25%) and in counties with Group 2 general hospitals app. 74,000 or about 30% since 1990.
- The low bed occupancy (45–69%) is often a problem for general hospitals (mainly Group 2) with a smaller local catchment area. Efficiency and service model of general hospitals with home county service delivery adjusted catchment area population less than 20,000 (Group 2: Järvamaa Hospital, Põlva Hospital, Valga Hospital, Hiiumaa Hospital, Läänemaa Hospital, Raplamaa Hospital, Jõgeva Hospital) need to be analysed in more detail.
- To date, the objectives set out in the EHMP2015 have been met in smaller extent than by regional and central hospitals.
- 16% of buildings in Group 1 and 4% in Group 2 hospitals have exceeded 50 years, which is an average amortisation limit of a hospital building that means that the building should be either completely renovated or replaced. 33% of buildings in Group 1 and 54% of buildings in Group 2 hospitals are 31 to 50 years old, and 44% of buildings in Group 1 of general hospitals and 36% of buildings in Group 2 have been built in the last 20 years.

- The average gross area 80 m² per bed in Group 1 hospitals is less than 100 m² that was the aim for general hospitals in the EHMP2015. The situation is especially alarming in Viljandi Hospital where the gross area per bed is 58 m² (probably due to old hospital buildings of psychiatry departments of Jämejala).
- The average efficiency of using X-ray machines is about 2-3 times lower than in central and regional hospitals.

Changing the functional floor plan of hospital buildings is technically more feasible if the buildings are built on a post-beam and/or mixed load structure. 77% of general hospitals' floor area is based on post-beam or mixed load structure. The rest is on load-bearing walls, which make the modernising significantly more difficult and expensive.

4.3 Mapping of financing flows

4.3.1 Economic sustainability

Methodology and approach

Economic sustainability in financial terms is usually determined by:

- positive and stable financial result (surplus), revenues and costs
- stable ability to serve short term and long-term liabilities (Liquidity Ratios)
- capability to renew fixed assets (such as property and medical equipment)

In this section financial indicators that are suitable to estimate these three dimensions will be analysed for all the HNPD hospitals. Primary goal is to determine the hospitals that fail to express economic sustainability and need closer investigation. More detailed hospital level sustainability analysis of these selected hospital is presented in section 4.5 below. In addition, detailed information on hospital financial mapping can be found in Annex 6 .

Main data source for revenues and costs was the Fiscal Year Report⁴² of each hospital from of NIHD (for 2004-2018). All hospitals have given a written permission in order to use and analyse the data. To complement to this data, balance sheets from the governmental public accounting information system (provided by Ministry of Finance) were used. For some general hospitals these data have been consolidated with regional hospitals (and therefore their balance sheets data are not available in public accounting information system), an extra query was made to the Ministry of Social Affairs. Financial data from these sources was available only for HNPD hospitals.

In order to estimate long-term financial sustainability of HNPD hospitals the following financial indicators were used:

- EBITA* (Earnings without investments grants and subsidies Before Interest, Taxes and Amortisation)
- EBITA* % of revenue total (EBITA* margin)
- Structure of hospital revenue

⁴² <https://www.riigiteataja.ee/aktiilisa/1211/2201/8047/m51Lisa%2013%20Tervishoiualane%20majandustegevus.pdf#>

- Structure of hospital running costs
- Current ratio (=current assets/short term liabilities)
- Debt/EBITA*
- Average reinvestment rate over the last 5 years for buildings (%)
- Average reinvestment rate over the last 5 years for medical equipment (%)

All indicators presented in the economic sustainability analyses are made available in dynamic data analyse environment of Tableau.

Findings

According to the government long-term healthcare investment policy the EHIF pricing is not meant to cover hospital infrastructure capital investments costs in full, and additional investment grants have been made available to selected hospitals according to the government health care policy. Therefore, received grants are excluded from our revenue analyses and EBITA* reflects earnings without governmental grants for investments. EBITA* of total revenue (EBITA* margin) indicates the organisation's profitability from daily operating activities excluding capital-related costs, interest and depreciation. In general ca 10% of EBITA margin is considered to be sufficient for sustainability. In the case governmental policy of additional investment grants will continue unchanged, also 4% EBIT* margin can secure financial sustainability⁴³. Lower surplus level indicates to potential problems in long term financial sustainability. Almost all Group 2 general hospitals (except Läänemaa Hospital) have had EBITA* margin systematically under 4% i.e. are not operationally sustainable in longer term perspective, even with governmental grants.

In 2018, the average share of EHIF contracts (without ambulance services) in total hospital revenue in hospitals without grants was 86% in regional hospitals and 84% in central hospital group, 82% in general hospital Group 1 and 70% in general hospital Group 2. For Group 1 it has decreased from 75% to 70% during 2014-2018 due to the increase of revenue from other healthcare providers and social care services. In other hospital types the EHIF revenue share has been stable.

In 2014–2016, the largest running costs' line item for all type of hospitals is medical personnel (physicians, nurses and care personnel): 43–48% for central and regional hospitals and 53–57% for general hospitals with increase for smaller general hospitals (Group 2). In 2018, the average share of other medical personnel cost was 16-17% in general and central hospitals and 14% in regional hospitals and has been increasing in central hospitals and bigger general hospitals since 2015. Premises running costs are rather small comparing to personnel cost (account 4–5% in hospital running costs in all hospital types) and have decreased in most hospital types except in regional hospitals.

⁴³ 4% is sufficient to cover regular smaller refinements of infrastructure because of ca 1/3 of necessary infrastructure investment cost is covered through EHIF prices

Average reinvestment rate over the last 5 years⁴⁴ of medical technology has been regularly under 20% in Kuressaare, Narva, Rakvere and Jõgeva hospitals in 2016-2018. The same indicator for buildings has been sufficient (i.e. above 10%) in most hospitals in 2012–2016, supported by the government investment program (including EU funds)⁴⁵. In general hospitals these investments have been related to nursing care, in central and regional hospitals to acute care optimization. Average 5-years building reinvestment rate has dropped under 10% for almost all general hospitals (both groups) in 2017 and 2018.

To benefit from governmental investment programs, hospitals have to provide co-payment. For that hospitals have engaged bank loans. Some bigger hospitals and most of smaller hospitals have reached to a critical debt service capability (debt/EBITA* indicator is higher than six or negative due to negative EBITA*). Only Läänemaa, Viljandi, Narva and Kuressaare hospitals have no problems or just minor problems with the debt/EBITA* ratio. NEMC has the highest debt/EBITA* ratio among bigger hospitals.

Current ratio was used to assess liquidity of the HNPD hospitals (Annex 6, Table 4).. Insufficient liquidity has been continuous problem for Jõgeva Hospital and for East-Tallinn Central Hospital during 2008–2018. For Raplamaa, Põlva and Hiiumaa hospitals the problem was actual until consolidation with regional hospital.

To evaluate long-term financial sustainability of HNPD hospitals we created a map displaying several relevant indicators. Just one warning indicator in a single year does not provide enough evidence on a profound long-term sustainability problem. However, existence of a number of warning level indicators can signal to potential permanent problems of economic sustainability. In our analysis we used a threshold of at least two warning indicators to include the hospital into more detailed level sustainability analysis.

Figure 37 Multivariate mapping of warning figures for financial sustainability

Type of hospital	Hospital name	EBITA* % of total revenue	Current ratio (current assets/short term liabilities)	Debt/EBITA*	5 years Average Reinvestment Rate Buildings	5 years Average Reinvestment Rate Equipment
Regional hospital	North Estonia Medical Centre					
	Tallinn Children's Hospital					
	Tartu University Hospital					
Central Hospital	East-Tallinn Central Hospital					
	Ida-Viru Central Hospital					
	Pärnu Hospital					
	West Tallinn Central Hospital					
General Hospital 1	Kuressaare Hospital					
	Narva Hospital					
	Rakvere Hospital					
	South-Estonian Hospital					
	Viljandi Hospital					
General Hospital 2	Hiiumaa Hospital					
	Järvamaa Hospital					
	Jõgeva Hospital					
	Läänemaa Hospital					
	Põlva Hospital					
	Rapla Hospital					
	Valga Hospital					

⁴⁴ Average over last 5 years is taken from 'Purchase value of medical equipment of one year /Remaining value of the medical equipment in purchase prices'

⁴⁵ List of funds engaged through EU support can be found here <https://www.sm.ee/et/struktuurivahendid-sotsiaalvaldkonnas-2014-2020>

All Group 2 general hospitals, excluding Läänemaa Hospital, have multiple warning indicators. Three Group 1 hospitals (South-Estonian Hospital, Rakvere Hospital and Narva Hospital) have more than one warning indicators.

Conclusions

Based on the last 10 years financial information analysis, regional and central hospitals do not have significant problems that could threaten their economic sustainability.

Most general hospitals, predominantly in Group 2, are in need for investments to renew their infrastructure, while their earnings are insufficient and/or loan burden being at warning level. There is also a trend for increasing personnel costs share in their running costs. These factors can put their long-term financial sustainability at risk.

On the base of sustainability analyses the following hospitals were selected for deeper analyses presented in the section 4.5 below: Jõgeva, Põlva, Rapla, Valga, Järvamaa, Läänemaa and South Estonia hospitals.

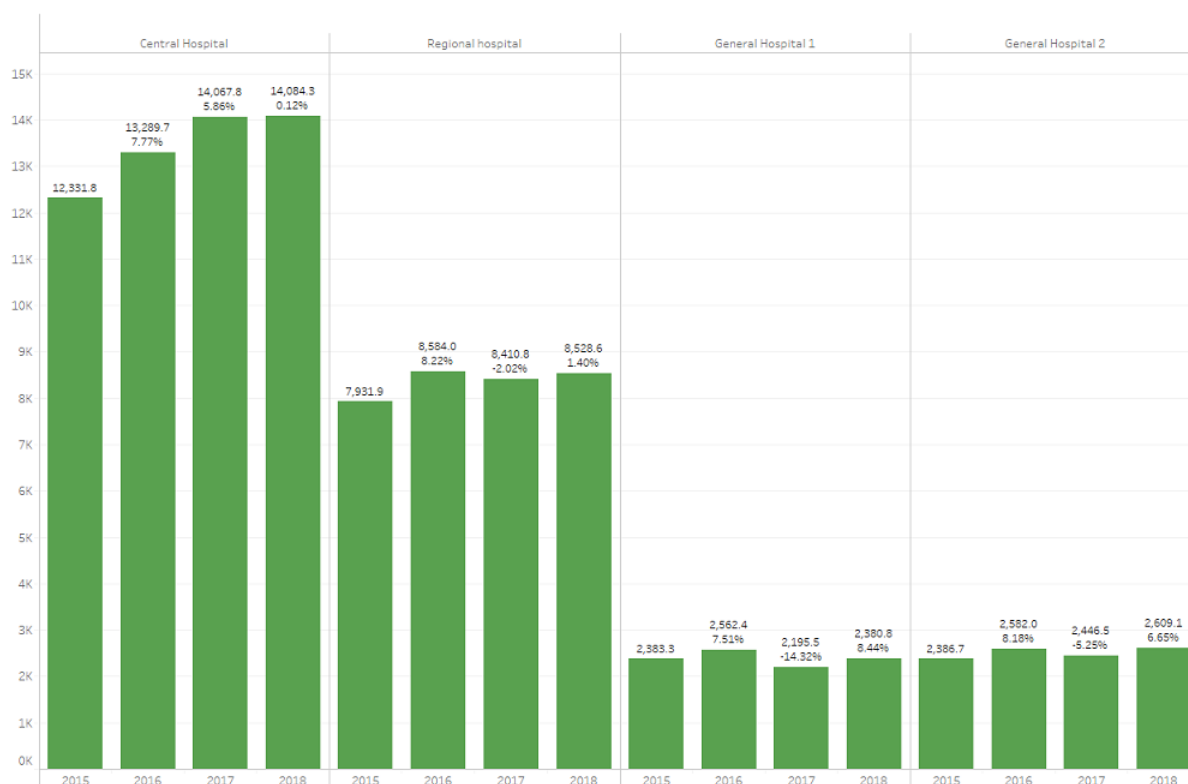
4.3.2 Analysis of financial incentives that influence service provision of HNBP hospitals

Introduction and general framework

The financial motivation associated with each source of income depends on the share of this income in the total income of the hospital. The main source of income for hospitals is EHIF contract, which accounts for more than 80% of most HNBP hospitals' income. Therefore, EHIF has the strongest position in motivating hospitals behaviour. Five hospitals provide ambulance services (Pärnu, Narva, Kuressaare, South-Estonia and Valga) that are financed through EHIF as well.

In general hospitals Group 2 that provide ambulance services the share of this source of revenue is about 10% of total income. In Pärnu Hospital the revenue from ambulance service is 8–9% of total income and in Valga Hospital about 15%. The next largest source of income in most hospitals is from other health care providers (mostly from family doctor practises, about 5–7%) and patient co-payments, which are usually in the range of 4–5% of the total income of the hospital. An important exception is Viljandi Hospital, for which the income received through EHIF contract is about 55% of the total income (2018). A significant part of Viljandi Hospital income is from psychiatric and tuberculosis compulsory treatment (app. 25% of total income) and social care services (app. 15% of income).

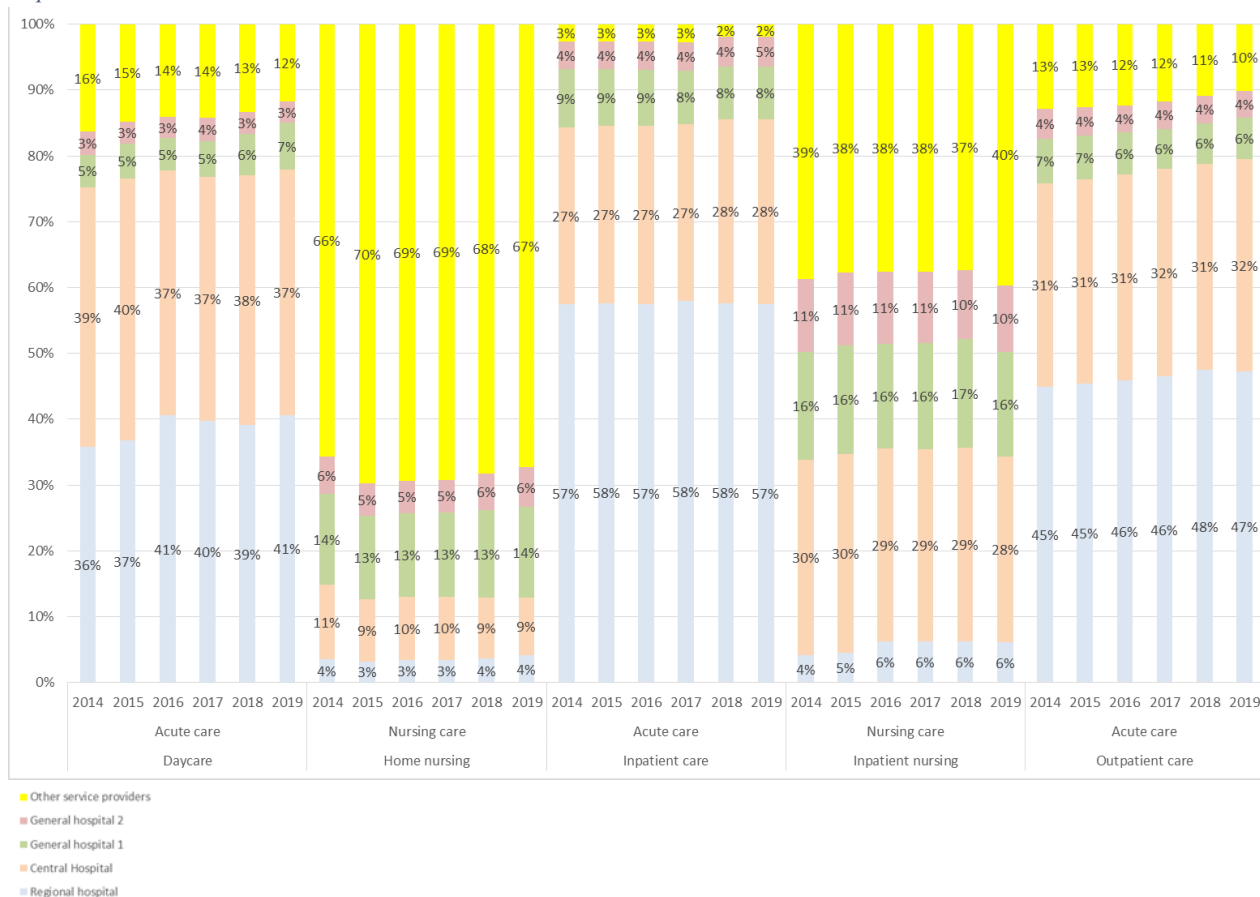
Figure 38 Revenue from patient fees and copayments in thousand EUR in the HNDP hospitals in 2015 -2018



According to the legislation in Estonia⁴⁶, HNDP hospitals have an obligation to ensure regional access of health care services and therefore HNDP hospitals do not compete with other health care providers for EHIF contract volume. EHIF contract volume of a HNDP hospital depends on the local need for treatment cases estimated by EHIF and the hospital's capability to satisfy the need (negotiated with the hospital). The share of services provided by HNDP hospitals in overall EHIF financed health care services has been relatively stable over the last six years, and counting for about 97% of inpatient specialist care, 88% of outpatient specialist care, 86% of day care, 62% of inpatient nursing care and 30% of home nursing.

⁴⁶ Health Services Organization Act <https://www.riigiteataja.ee/en/eli/ee/Riigikogu/act/518052020003/consolide>

Figure 39 Financial share of different types of health care provided by different HNBP hospital types and other service providers in 2014–2019, EHIF statistics.



EHIF draws on many traditional payment methods in contracting with hospitals, including fee-for-service (FFS), preparedness fee and diagnosis-related groups (DRG). EHIF blends these payment methods to create a mix of incentives that aligns with sector objectives while mitigating adverse effects, combining them as needed with cost and volume caps. EHIF also aligns payment methods across types of providers (acute care hospitals, nursing hospitals, specialty clinics) to incentivise service delivery in the right care setting, complemented by co-payments to induce commensurate care-seeking behaviours.⁴⁷

Specialty and treatment type based contracting is historically justified, since HNBP hospitals have an obligation to provide health care services in concrete specialties depending on the type of hospital. EHIF service prices are calculated using Activity Based Costing method and reflect approximate actual cost of services. This is good basis for developing more complex payment arrangements. Using FFS payments facilitates collecting necessary statistics on delivered services assisting to understand trends in the treatment process.

EHIF health care services costs per capita has increased by 29% in the period 2016–2019 (average salary increase during this period was 23% in Estonia). At the same time, the number of purchased treatment cases per capita increased by 7%, the number of bed days per capita

⁴⁷ Detailed description of payment methods can be found in World Bank 2017 report “Toward greater integration of care and improved efficiency — a critical review of EHIF’s payment system”. <https://haigekassa.ee/haigekassa/cesti-haigekassa/uuringud-ja-analusiid>

decreased by 15% and the number of outpatient appointments per capita increased by 2% (Table 15). Described changes are in line with general trends in developed countries⁴⁸.

Table 15 EHIF health care services cost per capita compared to EHIF purchased treatment cases, inpatient days and outpatient visits per capita in Estonia (sources: EHIF database, Statistics Estonia).

	HIF treatment cost per habitant*				HIF cases per habitant*				Inpatient days per habitant				Outpatient visits* per habitant					
Year	0-19 year	20-64 year	65+ year	Total	0-19 year	20-64 year	65+ year	Total	0-19 year	20-64 year	65+ year	Total	0-19 year	20-64 year	65+ year	Total		
2016	239	376	1008	468	2,20	2,46	3,79	2,66	0,49	0,84	4,11	1,39	2,01	3,29	5,95	3,53		
2017	254	396	1071	497	2,18	2,40	3,78	2,62	0,43	0,66	3,82	1,22	2,40	3,10	5,52	3,43		
2018	258	426	1183	539	2,16	2,34	3,80	2,59	0,44	0,66	3,89	1,24	1,98	3,17	6,36	3,55		
2019	298	453	1293	586	2,13	2,31	3,81	2,57	0,39	0,60	3,73	1,18	2,52	3,20	5,94	3,60		
	HIF treatment cost per habitant*				HIF cases per habitant*				Inpatient days per habitant				Outpatient visits* per habitant					
Change %	0-19 year	20-64 year	65+ year	Total	0-19 year	20-64 year	65+ year	Total	0-19 year	20-64 year	65+ year	Total	0-19 year	20-64 year	65+ year	Total	Change of CPI**	Change of salary***
2017 vs 2016	6,6%	5,4%	6,2%	6,3%	-0,5%	-2,5%	-0,3%	-1,4%	-10,5%	-21,5%	-7,2%	-12,0%	19,5%	-5,5%	-7,2%	-2,9%	3,4%	6,5%
2018 vs 2017	1,3%	7,6%	10,5%	8,5%	-0,9%	-2,3%	0,5%	-1,2%	0,3%	-0,8%	2,0%	1,6%	-17,5%	2,1%	15,2%	3,5%	3,4%	7,3%
2019 vs 2018	15,7%	6,3%	9,2%	8,7%	-1,6%	-1,1%	0,2%	-0,7%	-11,5%	-7,7%	-4,1%	-5,3%	27,4%	1,0%	-6,5%	1,6%	2,3%	7,4%
2019 vs 2016	24,9%	20,6%	28,3%	25,4%	-3,1%	-5,9%	0,5%	-3,3%	-20,5%	-28,1%	-9,2%	-15,4%	25,6%	-2,5%	-0,1%	2,0%	9,4%	22,8%

* Without dental care and primary care

**Annual Consumer Price Index (Statistics Estonia)

***Annual change of average gross salary (Statistics Estonia)

According to EHIF estimation, annual demand for health care services exceeded the actual budget by 6-9% in specialty care and by 4% in nursing care in 2017-2019. Despite of significant uncovered demand, the existing financing methods have helped the EHIF to keep the specialty care budget under control (Table 16). Budget implementation rate (Expenditure/Budget) has been 100-102% in 2014-2019. Starting cover excess cases, the share of excess cases costs in specialty care overall expenditure has been 2%. In 2015-2017, the cost of excess cases has been equal to the budget over-run, in 2019 the cost of excess cases has been covered by the specialty care budget.

On the other hand, substantial EHIF expenditure per capita increase and decrease of treatment cases per capita indicates mounting problems in access to health care services. (see more detailed analyses in Annex 8).

Table 16 Specialty care and nursing care estimated demand, EHIF budget, expenditure and related figures (Source: EHIF data)

	Specialty care								Nursing care							
Year	EHIF estimated annual demand	EHIF budget	Budget annual increase	Actual EHIF expenditure	Expenditure annual increase	Budget implementation	(Demand-Budget)/Budget	Share of the cost of excess cases in specialty care total expenditure	EHIF estimate d annual demand	EHIF budget	Budget annual increase	Actual EHIF expenditure	Expenditure annual increase	Budget implement-ation	(Demand-Budget)/Budget	
	Thousand EUR	Thousand EUR	%	Thousand EUR	%	%	%	%	Thousand EUR	Thousand EUR	%	Thousand EUR	%	%	%	
2014	NA	522934		529044		101%	NA	0%	NA	23937		24537		103%	NA	
2015	NA	548830	5%	561533	6%	102%	NA	2%	NA	27030	13%	28450	16%	105%	NA	
2016	647771	577377	5%	590917	5%	102%	12%	2%	34141	30258	12%	30103	6%	99%	13%	
2017	655582	614010	6%	629133	6%	102%	7%	2%	33447	32078	6%	31850	6%	99%	4%	
2018	743131	679631	11%	688990	10%	101%	9%	2%	38279	36676	14%	35636	12%	97%	4%	
2019	795414	750382	10%	752053	9%	100%	6%	2%	41972	40448	10%	39982	12%	99%	4%	

Since years, EHIF has been prioritising universal and equal access to health care services and has achieved relatively similar distribution of EHIF paid health care services (Table 16). In assessing equal geographical distribution of funds it has to be noted that demand of inpatient

⁴⁸ http://www.hope.be/wp-content/uploads/2018/07/2018_Hospitals-in-EU-28-Synthesis-final-for-publication-002.pdf

treatment per person in age group 65 and older is app. three times higher in than in general population and, hence, connected with significantly higher treatment cost per capita.

Table 16 Distribution of the care of all habitants and 65+ age habitants between different counties financed by EHIF (wo primary and dental care) in 2019, source HIF database.

Patient county	Treatment cases per habitant (wo primary and dental care)	Treatment cost per habitant (wo primary and dental care)	Hospital days per habitant	Outpatient visits per patient (wo primary and dental care)	Treatment cases per 65+ habitant (wo primary and dental care)	Treatment cost per 65+ habitant (wo primary and dental care)	Hospital days per 65+ habitant	Outpatient visits per 65+ patient (wo primary and dental care)
HARJU	2,6	556	1,0	3,6	4,1	1332	3,6	6,5
HIIU	2,2	463	1,2	3,0	3,2	989	3,5	4,6
IDA-VIRU	2,7	673	1,5	4,5	3,7	1231	3,3	6,4
JÕGEVA	2,7	658	1,5	3,5	3,7	1385	4,3	5,2
JÄRVA	2,4	565	1,2	3,4	3,1	1125	3,5	5,0
LÄÄNE	2,5	640	1,5	3,4	3,5	1327	4,1	5,1
LÄÄNE-VIRU	2,2	555	1,1	3,3	3,1	1114	3,2	5,2
PÕLVA	2,6	598	1,5	3,4	3,7	1272	4,3	5,0
PÄRNU	2,8	623	1,5	3,8	4,0	1265	4,3	5,6
RAPLA	2,3	601	1,2	3,1	3,3	1323	4,1	4,6
SAARE	2,6	587	1,4	3,2	3,7	1275	4,6	5,5
TARTU	2,6	598	1,1	3,4	3,8	1402	3,6	5,7
VALGA	2,7	594	1,4	3,5	3,7	1195	4,0	5,6
VILJANDI	2,4	583	1,4	3,4	3,4	1199	3,9	5,2
VÕRU	2,5	618	1,6	3,5	3,4	1348	4,8	5,2
Total	2,6	586	1,2	3,6	3,8	1293	3,7	5,9

Collaboration between HNPD hospitals have been practiced already decades but some 5 years ago MoSA initiated an official HNPD hospital consolidation process. Regional hospitals were encouraged contributing to management of smaller general hospitals with the goal to improve and optimize service provision at local level and secure economic sustainability of those hospitals. Between 2014-2017, six general hospitals (South-Estonia Hospital, Valga Hospital and Põlva Hospital; Läänemaa Hospital, Rapla Hospital and Hiiumaa hospital) were consolidated with the Tartu University Hospital and the North Estonia Medical Centre accordingly. This process has had influence on the incentives of most HNPD hospitals (and will be analysed as well below in the chapter 4.5).

Goal of the analyse and methodology

The main purpose of financial incentive analysis is not to assess general health care system financing framework in Estonia but to target different aspects of patient pathway (hospital care, pre-hospital care and follow-up care after discharge) that have or may have significant influence on the financial sustainability and person-centeredness in hospitals and in lesser part in health care system in general.

This approach was selected because of the major triggers of financial unsustainability of health care system in Estonia (like in other developed countries) are mostly related to ageing population, higher expectations of patients, suboptimal allocation of resources and rising unit cost of care that is influenced by higher health technology use but also fast increasing cost of medical personnel. Financing incentives alone are not sufficient to solve the problem but may help to achieve sustainability with effective organization of care.

According to the “National Health Development Plan 2020-2030” of Estonia, person-centred care is a major objective of health care system. Therefore, the viewpoint of person-centred care was selected as the general framework for analysing incentives that can direct the system toward long-term financial sustainability.

The eight Picker Principles of Person Centred Care⁴⁹ were adopted to the Estonian context and as a result this analyse to address to a question how existing payment methods in use in hospitals have supported achieve:

1. Equal access to primary consultation and diagnostics close to home within a reasonable time
2. Appropriate and in time emergency care
3. Minimally invasive, smooth, effective and efficient acute care
4. Proactive primary and secondary prevention
5. Patients in taking responsibility for their health and reasonable use of healthcare services
6. Follow-up, rehabilitation and after-care close to home/at home
7. The integrity of the treatment process and the integration of health services with other human needs, including social services; person-centred approaches
8. Development and use of new more effective treatment approaches/methods

Current weaknesses and opportunities related to financial incentives that influence hospitals are studied more carefully and as ‘the money follows the patient’ in acute care, patient motivations and mobility is analysed. Also, new ongoing development projects and their financial goals are reviewed.

HIF, NIHD and OECD data were used for understanding situation and historical trends. Results of other surveys like the World Bank Group reports and National Audit reports are taken into account where possible and necessary.

Findings

Equal access to primary consultation and diagnostics close to home within a reasonable time

Access to health care is a priority in national health policy in most OECD countries with below OECD average health expenditure as percentage of GDP⁵⁰. This means in practice that the country is implementing a system of referral letters and setting national targets on maximum waiting times⁵¹, compliance with these targets is systematically analysed and taken into account in health policy decisions, including financing.

Estonian share of health care expenditure in GDP is about 30% below the OECD average (6,7% in Estonia vs. 8,8% OECD average in 2018)⁵² and referral letter is a precondition⁵³ for EHIF reimbursement for specialist consultation and EHIF has introduced targets on maximum waiting times. However, patients with referral letters have still problems to register for specialist consultations within reasonable time frame – only 55% of referral letters given by FD-s are used by patients during the three following months from the issuance (Table 17). Patients are ‘left alone’ with their referral and are not actively supported to get appointments with specialty care.

⁴⁹ <https://www.picker.org/about-us/picker-principles-of-person-centred-care/>

⁵⁰ http://www.keepeek.com/Digital-Asset-Management/oecd/social-issues-migration-health/waiting-times-for-elective-surgery-what-works_9789264179080-en#page173

⁵¹ <https://www.sciencedirect.com/science/article/pii/S0168851013001759>

⁵² [https://www.oecd-ilibrary.org/docserver/4dd50c09-](https://www.oecd-ilibrary.org/docserver/4dd50c09-en.pdf?expires=1601242195&id=id&accname=guest&checksum=2D8DADF448C87DA527C75D258EF8F883)

[en.pdf?expires=1601242195&id=id&accname=guest&checksum=2D8DADF448C87DA527C75D258EF8F883](https://www.oecd-ilibrary.org/docserver/4dd50c09-en.pdf?expires=1601242195&id=id&accname=guest&checksum=2D8DADF448C87DA527C75D258EF8F883)

⁵³ Except gynaecology, ophthalmology, dermatology and psychiatry

Table 17 Use of specialty care (digital) referral letters given by FD-s to the patients in December 2019 and May 2020.
Source HWISC data

Number of referral letters given by FD-s in Dec 2019	Used for booking during December	Used for booking during January	Used for booking during February	Used for booking during 3 months
44 thousand	17 thousand (39%)	5 thousand (11%)	1 thousand (2%)	23 thousand (52%)
Number of referral letters given by FD-s in May 2020	Used for booking during May	Used for booking during June	Used for booking during July	Used for booking during 3 months
38 thousand	15 thousand (39%)	5 thousand (13%)	1 thousand (3%)	21 thousand (55%)

E-consultations by specialty doctors to FD-s can be useful tool increase efficiency of the service delivery process and improve timely access to specialty care. However, e-consultations are still marginal and have insignificant impact on referrals to specialist care (approx. 2,5% of all specialist care primary appointments). FD-s are not always motivated to use e-consultations due to the additional effort that is related to the requirement to formulate a explicit question to specialty care doctor and give pre-agreed format information on patient, which is not needed for regular e-referral letter.

There is an increasing trend that patients are getting specialist care outside of their home county. This is caused by two factors: (1) decreasing availability of specialty care capacity in their local hospital, and (2) increased expectations for treatment quality by patients. On the other hand, there is also evidence that existing social transportation offered by municipalities is often insufficient and is not integrated with health care service provision.⁵⁴

Table 18 Share of outpatient specialty care visits received in patient's home country and share of outpatient visits in 8 specialties received in patient's home country, source: EHIF data 2015, 2019

Patient home country	Outpatient visits in own county 2019	Outpatient visits total 2019	% of visits received in own county 2019	% of visits received in own county 2015	Outpatient visits 8 specialties in own county 2019	Outpatient visits 8 specialties total 2019	% of visits received in own county 2019	% of visits received in own county 2015
HARJU	1 835 208	1 968 342	93%	94%	920 393	996 356	92%	95%
HIU	12 308	26 948	46%	49%	11 172	17 596	63%	66%
IDA-VIRU	452 752	559 978	81%	83%	268 914	303 735	89%	89%
JÕGEVA	37 949	93 356	41%	45%	32 516	57 897	56%	63%
JÄRVA	54 635	96 425	57%	59%	38 961	57 354	68%	67%
LÄÄNE	41 129	65 705	63%	60%	38 864	48 523	80%	73%
LÄÄNE-VIRU	106 006	177 351	60%	68%	83 432	111 027	75%	80%
PÕLVA	33 772	78 438	43%	52%	28 937	53 113	54%	68%
PÄRNU	257 401	311 945	83%	85%	156 480	174 906	89%	91%
RAPLA	39 465	99 969	39%	52%	32 653	57 782	57%	64%
SAARE	66 677	97 172	69%	72%	54 413	64 521	84%	86%
TARTU	407 382	454 259	90%	91%	200 293	235 791	85%	86%
VALGA	45 064	88 094	51%	50%	39 739	60 580	66%	65%
VILJANDI	97 523	143 371	68%	66%	83 026	100 481	83%	80%
VÕRU	66 695	111 720	60%	60%	62 617	83 471	75%	74%
Grand Total	4 373 073	4 373 073	100%	100%	2 423 133	2 423 133	100%	100%

Another channel to improve access to medical consultation is phone/digital-consultation (tele-consultations). The share of tele-consultations makes 40% of all FD and PHC nurse contacts. As an extraordinary measure during COVID-19 outbreak EHIF started to finance tele-consultations in specialty care. Share of tele-consultations increased rapidly to app. 30% of specialty care visits and the full potential is not utilised. From September 2020 tele-consultations were formalised by the governmental as a regular reimbursement item.

EHIF provides also additional financial motivation for FD-s to join into group practises and to secure access to services after normal business hours⁵⁵. Most of ED visits take place between

⁵⁴ https://sasak.ee/application/files/3414/7065/9771/Sotsiaaltransporditeenuse_kontseptsioon.pdf

⁵⁵ <https://haigekassa.ee/partnerile/raviasutusele/perearstile/esmatasandi-tervisekeskused>

8 a.m-6 p.m and in 73% of ED visits patients were approaching ED by her/himself (EHIF ED statistics for 2019). This means that most of those patients arrive into ED during FD-s working hours, which is also confirmed by National Audit ED Report⁵⁶. Approximately 50% of these patients need some sort of surgery due to the injury and FD-s are usually not qualified to offer surgical services. Recent developments in ED financing⁵⁷ are aimed to motivate hospitals to prioritise “yellow” and higher triage category patients and to refer the lower level triage patients to PHC. However, there is no proper communication channel from ED-s that informs FD-s on the self-referred patients and, hence, FD-s cannot take any responsibility for her/his patients self-referrals (this was also feedback from interviews with the hospital focus groups in chapter 4.1.6).

Patient co-payment in direct self-referral to ED-s is similar to usual co-payment in specialty care and there is no financial motivation for a patient to go to FD if (s)he is looking for specialist consultation. With FD-s referral patient must pay similar co-payment as going to ED directly. Also, there is no difference in co-payment in ED depending time of approaching ED – during daytime or after business hours. Similarly, there is no co-payment differentiation with life threatening and non-life-threatening conditions. The payment is low (5 EUR) and in practice does not influence patient’s choice (World Bank 2017⁵⁸).

Appropriate and in time emergency care

In 2015-2019, the number of patients who arrived into ED-s by ambulance has doubled (from 250 to 460 cases per day). EHIF is reimbursing ambulances on global budget based on the number and type of ambulance units. Existing ambulance service provision data collected by HWISC through e-ambulance is not used by EHIF in order to develop more sophisticated payment systems.

Patients taking responsibility for their health and reasonable use of healthcare services

The current system may confuse patients in finding optimal access to health care system. Availability of self-triage tools are limited. For example, certain set of questions could lead patients to better understanding if (s)he needs to refer to FD, to specialty care doctor directly, to ED or better call to a help-line (for example Perearsti Infotelefon)⁵⁹. There is a potential to enhance patient education and responsibility for using the system more effectively and appropriate co-payments can help to motivate patients to use the system.

The family medicine 24/7 phone help-line (Perearsti infotelefon) is meant for minor health problems and helps patients to assess the need for referring to ED or FD. In weekends and bank holidays the service enables to renew already existing prescriptions. 24/7 available phone consultation helps to optimise unnecessary ED visits. Still ca 20 % of adult population have not heard of Perearsti Infotelefon⁶⁰. Most of the users of the help-line are elderly people.

⁵⁶ <https://www.riigikontroll.ee/Suhtedavalikkusega/Pressiteated/tabid/168/ItemId/1038/amid/557/language/et-EE/Default.aspx>

⁵⁷ EHIF started to finance ED-s on the base of preparedness fee since the beginning of 2020. In calculating the main cost component of the ED preparedness fee - the cost for medical staff - EHIF uses the statistics of cases of the yellow and orange triage category from hospitals

⁵⁸ “Toward greater integration of care and improved efficiency” <https://haigekassa.ee/haigekassa/cesti-haigekassa/uuringud-ja-analuusid>;

⁵⁹ Association of Estonian Family Doctors has tried to give the patient such kind of simple instructions but these are difficult to find and does not cover all health conditions and more detailed instructions about health care providers and co-payments: <https://www.perearstiselts.ee/esilehe-uudised/5685-tervisehacire-kas-perearst-voi-emo>

⁶⁰ Eesti elanike hinnangud tervisele ja arstiabile <https://www.haigekassa.ee/haigekassa/cesti-haigekassa/uuringud-ja-analuusid>

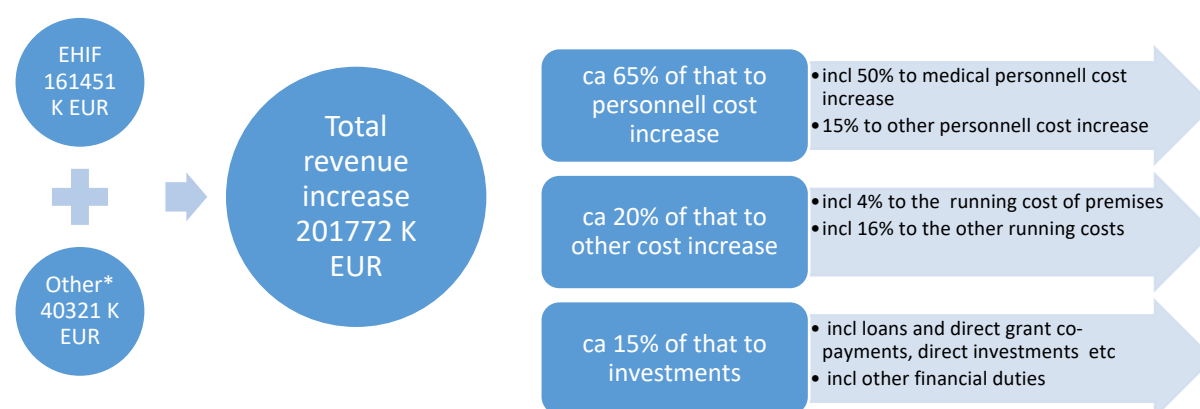
For the patient with a simple health problem it might be sufficient for the doctor to provide verbal advice with notes in the patient records. However, for a multimorbid patient a more sophisticated treatment and care plan to enable both, the patient and his/her relatives to follow treatment guidelines, is needed. Although EHIF is already financing preparation of various treatment and care plan developments, the plans are often meant for health care personnel and not to help patient and her/his relatives.

Minimally invasive, smooth, effective and efficient acute care

Minimally invasive principle means that diagnostics and treatment should be provided at the lowest possible health care provision level. Effective financing systems can support developments toward this direction.

During the period of 2014-2018, HNBP hospitals have experienced 31% increase in EHIF financing, from 513 to 674 MEUR. The main reason of the increase has been related to medical personnel minimum salary increase. In addition to EHIF also income from other sources like ambulance and services for uninsured people have increased (Figure 40).

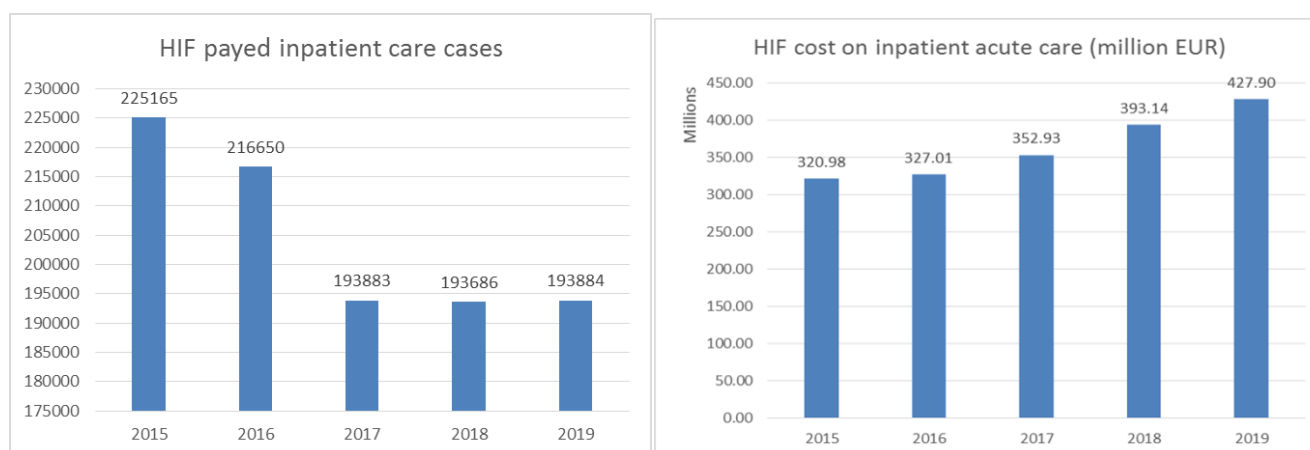
Figure 40 Revenue increase (EHIF revenue + all other revenues except investment grants) and cost increase in HNBP hospitals during 2014-2018, NHDI data



*Other revenue does not include investment grants

In 2015-2019, there has been a trend for EHIF paid active treatment cases to shift from inpatient to day care and outpatient setting: less 35 000 inpatient cases and more 20 000 day care and 50 000 outpatient cases. However, the decrease in inpatient cases has not been reflected in EHIF inpatient care expenditure (Figure 41).

Figure 41 Change in inpatient specialty care cases and EHIF costs in 2015-2019 (EHIF data)



Despite of use of DRG-s, the number of diagnostic tests has been increasing substantially, in particular at inpatient settings (Table 19). The World Bank Group has estimated that taking into account the patient's age or systemic comorbid condition, 2014-2015 on average 26% of cases in all HNPD hospitals at least one pre-surgery unjustified examination was performed.⁶¹

DRG price that is listed in the EHIF service list is used if the cost of inpatient case remains into certain range (i.e. between so called DRG lower and upper limit). Inpatient cases that remain outside DRG upper and lower limit are called DRG price exemptions. The share of DRG price exemptions has increased in all types of hospitals i.e. DRG-s became less homogenous (Annex 8 Figure 10). In other words, hospitals are doing each year more different services under the same DRG. Aligning DRGs with clinical guidelines should be prioritised instead of calculation of DRG prices on the base of previous year actual service consumption. DRG grouping guidelines for all specialties should be available.

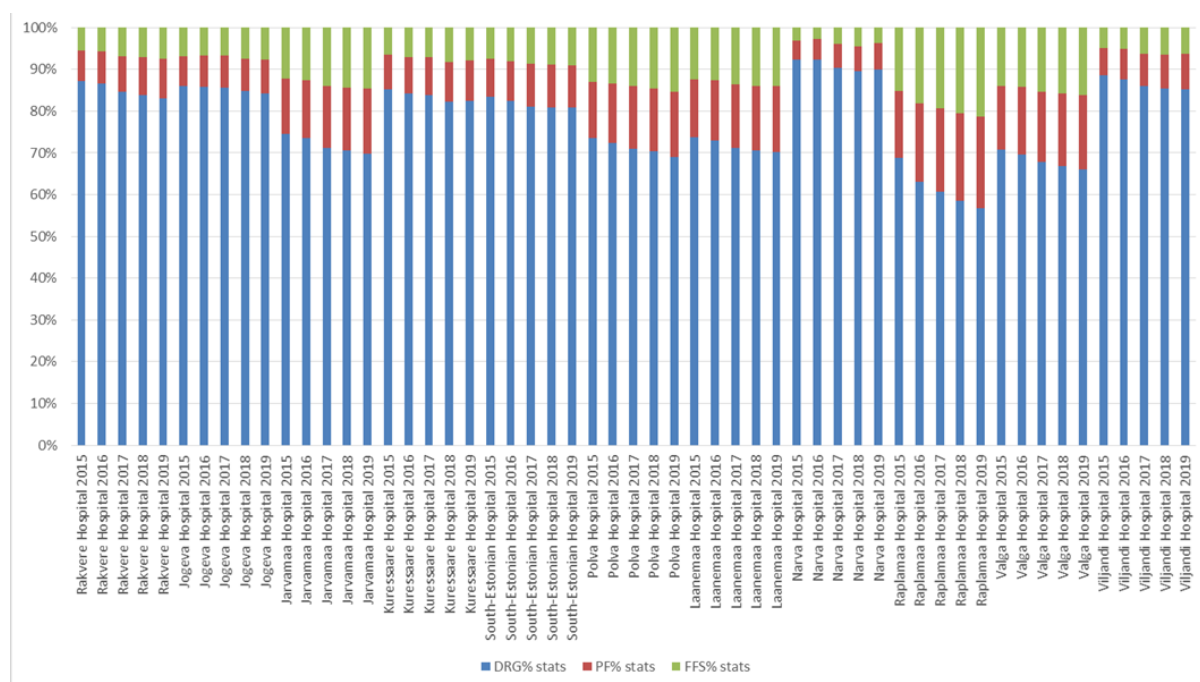
Table 19 Change of absolute number of lab tests in 2011-2019 and change in distribution of lab tests between different type of care in 2011- 2019 (Source: EHIF statistics)

	Laboratory investigations			
Year	2011	2015	2018	2019
Total number of used service codes	4 061 721	5 100 524	6 568 207	6 899 144
Share in outpatient care %	62%	63%	48%	49%
Share in day care %	2%	2%	2%	2%
Share in inpatient care %	36%	35%	50%	49%

The DRG based income share in inpatient care expenditures is more than 90% and has been stable in regional and central hospitals. In general hospitals the share is much lower and decreasing, while preparedness fee and FFS income constantly increasing over the period 2015-2019 (Figure 42). The share of preparedness fee, which is not related to any specific incentives, has reached to ca 15% of inpatient revenue in Group 2 general hospitals.

⁶¹ <https://haigekassa.ee/cesti-tervishoiususteemi-integreerituse-hindamise-indikaatorid>

Figure 42 Share of DRG payment, FFS payment and preparedness fee (PF) in inpatient contract sum in general hospitals 2015-2019, EHIF data



Preparedness fee is meant to cover salary cost related to 24/7 preparedness of specialty care doctors. In general, in Group 2 hospitals there is low use of ED services and on average less than 20 ED cases per day in most hospitals (Table 20). On average, app. 40% of ED visits take place outside of business hours and⁶² the number of referrals rate per day in Group 2 hospitals is rather low. Therefore, the calculated preparedness fee cost per an emergency case outside usual business hours in these hospitals is many-fold compared to an average outpatient case cost.

Table 20 Average number of emergency care cases per day in the General hospitals in the Group 2.

Indicator	ED cases per day on average (2019)	Estimated number of ED cases per day after usual business hours (8-18) ca 40%	Preparedness fee cost of hospital 2019 per an ED case provided after usual business hours
General Hospitals Group 2			
Järvamaa Hospital	33	13	122.91
Jõgeva Hospital	8	3	169.00
Läänemaa Hospital	20	8	202.80
Põlva Hospital	14	6	289.72
Raplamaa Hospital	19	8	213.48
Valga Hospital	17	7	238.59

⁶² <https://www.riigikontroll.ee/Suhtedavalikkusega/Pressiteated/tabid/168/ItemId/1038/amid/557/language/et-EE/Default.aspx>

EHIF's current model of purchasing inpatient specialist medical care is emphasising services provided by doctors and does not motivate for delivery of supporting services (like rehabilitation). DRG based payment model does not motivate hospitals to integrate rehabilitation into the treatment package. However, EHIF has recently implemented a stroke handling project that includes early rehabilitation and thus facilitates to reduce chronic functional impairments.⁶³

The use of day care in diagnostics has increased significantly (65% between 2011-2019 and 21% in 2015-2019). This may also indicate that patients who could be investigated at outpatient settings, due to more favourable contract terms, are tested at day care. Day surgery is decreasing in all Group 2 general hospitals but has increased in Group 1 general, central and regional hospitals except The Tallinn Children's Hospital (Annex 8 Table 15). Hence, there is still room for improvement.⁶⁴

Independent outpatient visits by nurses are not prevalent despite available reimbursement for the service, however, the share of repeated visits to physicians is growing (ca 50% of all doctor visits). The reason for relatively low share of independent nurse visits can be in insufficient financial incentives.

Follow-up, rehabilitation and after-care close to home/at home

There are several acute care conditions (acute myocardial infarction, stroke, heart failure, hip fracture, cholecystectomy) where follow-up outpatient visit after discharge is an integrated part of proper care plan. According to WB assessment less than 40% of patients with these conditions had follow-up visits by their family physician or specialist doctor within 30 days post-discharge. Even after 90 days post-discharge, more than 45% of patients with these conditions did not receive any follow-up care.⁶⁵ Continuity of care after discharge was also referred as a problem by hospital personnel during our interviews.

Early inpatient after-care (*esmane järelravi*) in general hospital close to patient's home following an acute treatment episode at regional or central level hospital enables to optimise treatment costs and make the patient journey more person-centred. Early inpatient after-care counts only for 5-10% of inpatient cases in general hospitals, while available financing and pricing being restricting factors to increase the share level.

Consultations between doctors from different hospitals are not directly supported by financial incentives, they often take place as a complimentary un-paid support between colleagues. This kind of cooperation is easier between „networking hospitals”, since more difficult patients are often consulted with an aim to be potentially referred to the regional hospital. Hospital networking have had positive influence on reduction duplications in patient testing (Annex 8 Table 7).

In 2016-2019, the number of bed days (excluding the number of psychiatric bed days) compensated by the EHIF to HNDP hospitals has decreased by about 200 000 days, while the number of inpatient nursing bed days has increased by about 20 000. Continuity of care is not always secured after discharge from hospital to home care. There is an unused potential in improving home care, psychiatric home nursing and home rehabilitation services.

⁶³ “Bundled Payment for Ischemic Acute Stroke” <https://haigekassa.ee/haigekassa/eesti-haigekassa/uuringud-ja-analuusid>

⁶⁴ HNDP hospital quality indicators – Share of surgeries in day care setting (3 surgeries) <https://www.haigekassa.ee/ulevaade-ravi-kvaliteedist-eesti-tervishoiususteemis>

⁶⁵ Indicator „Statsionaarse aktiivravi järgne puudulik jätkuravi” <https://www.haigekassa.ee/partnerile/tervishoiuteenuste-kvaliteet/ravikvaliteedi-indikaatorid/aruannete-arhiiv#tab-tervishoiususteemi-integreerituse-hindamise-indikaatorid>

Since 2020, the EHIF list of health care services includes a new line item of “Nursing service in elderly homes”. This service will potentially reduce the need for home nursing at elderly homes but at the same time reduces the difference between nursing hospital and elderly home service (since in case of both services medical nurse service is available to some extent). Home care as a social service is provided by municipalities (usually with a small co-payment for the client) and is not integrated and coordinated with home nursing services. Integration of these two services has potential to optimize resources and improve both service quality and patient satisfaction.

Proactive primary and secondary prevention

While prevention is an activity mostly taking place at primary level, hospitals have also important role in secondary prevention, mainly offering screenings and vaccinations as well as counselling. All prevention-related services are not explicitly identified as preventive services in the EHIF's service list and contract. Therefore, it is difficult to allocate the share of prevention in EHIF contracts.

Cancer screening is an important part of primary screening activities. It is generally organised in the way that the Cancer Screening Registry is inviting relevant target group people to the screening but there is no system to follow-up, whether the person has actually received the invitation and no other pro-active measures to make people actually attend. This is obviously one of the reasons Estonian screening coverage levels to be substantially lower compared to Nordic countries. Smart outcome-based financing methods for hospitals could improve the attendance.

Personal health care using genomic data is a powerful tool to improve effectiveness and person-centredness of both, primary as well as secondary prevention. An ongoing RITA 1 activity „Clinical pilot projects of personalised medicine in the precise prevention of breast cancer and cardiovascular diseases“ is a starting point to bring proactive evidence based genomic tools in everyday medical practice⁶⁶.

The integrity of the treatment process and the integration of health services with other human needs, including social services; person-centred approaches

The absence of adequate social care services can significantly increase the need for health care, and therefore cause an increase in health care costs⁶⁷. Compared to health care services, HNDP hospitals provide marginal share of social services. WB report 2017 and hospital interviews indicated that the technical and juridical restrictions for patient level data exchange and fragmented financing are major reasons why development of integrated and person-centered care is suffering.⁶⁸

The specialised care reimbursement model used today is motivating provision of services and is not aimed to health gains. This is accompanied with a motivation to refer patients to the next service episode or service provider. There is low financial motivation to provide services based on the patient's overall health outcome or goals. Therefore, EHIF has started to look for solutions to pursue integrity of treatment process and motivate greater cooperation. Three ongoing projects are targeted to improve patient-centeredness: (1) EHIF **stroke project** is aimed for implementing a funding based on the stroke patient's treatment pathway, (2) **Risk-**

⁶⁶ <https://sisu.ut.ee/pmkliinilisedjuhtprojektid/avaleht>

⁶⁷ “Reducing the burden of care in Estonia” https://www.riigikantselei.ee/sites/default/files/content-editors/Failid/hoolduskoormus/estonia_ltc_report_final.pdf

⁶⁸ https://www.riigikantselei.ee/sites/default/files/content-editors/Failid/hoolduskoormus/hoolduskoormuse_rakkeruhma_lopparuanne.pdf

stratified, enhanced care management program for family doctors and (3) **PAIK project** with the goal for integration of health and social services provision to provide person-centred care for certain risk groups.

Hospital networking and consolidations have had positive influence on better coordination of service provision, while also helped to take advantage of economies of scale and improve service quality in smaller hospitals. For example, in Rapla, Põlva and South Estonian hospital the increase in medical investigations has slowed down remarkably after 2015 (compared to earlier period strong increase). Group purchasing of medicines and medical devices (in all joint hospitals), joint development of IT services (TUH and his sister hospitals) and other supportive actions (joint trainings to the medical personnel etc) are advantages of networking and consolidations. However, on the negative side can be listed centralisation of outpatient care caused by insufficient financial incentives for consolidating hospitals to deliver simple specialty care services at consolidated hospitals. However, according to the feedback from our survey focus groups of consolidated hospitals the consolidation is considered to be positive development for general hospitals.

Development and use of new more effective treatment approaches/methods

Our mapping has revealed a list ITC problems between hospitals and other health care service providers (see Chapter 4.4.2). However, IT developments in hospitals are not financially supported or motivated by EHIF.

In order to introduce innovations in health care system, legal acts enable the use health insurance resources for financing the health care development activities and programs. In order to do that, EHIF has to seek preapproval from MoSA. Currently there is decided to use created innovation fund for EHIF stroke project and Viljandi Hospital PAIK project. There is not available any public fund for testing new health care technologies in Estonia. Financial burden and risk to take into use new technologies is entirely on health care service providers.

EHIF does not finance currently any digital solutions for smart devices for monitoring long-term illnesses (*e.g.* HIV, oncology etc.).

Conclusions

Based on the findings above some immediate conclusions can be proposed. For more in-depth analysis however, future work considering selected strategic long-term health care system development models will be needed.

- While the networking process has been effective in preventing duplications of diagnostic investigations, there are still insufficient motivation for regional or central hospitals to decentralise less demanding services to consolidated local level hospitals.
- Hospitals, primary care service providers and social support system do not always share common goals for comprehensive continuous patient treatment. Common care plans are not used in everyday practice and care coordination is not financially incentivised.
- Preparedness fee, which lacks efficiency motivating goal, is playing an increasingly important role in the income in most Group 2 general hospitals.
- DRG-s applied today in the system are not based on treatment guidelines and thus do not support treatment quality, efficacy and person-centredness.

- Financing instruments are not supporting care continuity and person-centredness and coordination between the care process stakeholders. Referral letter is not seen as a tool of integration of the treatment process but just as a ticket to the next treatment level.
- Patient and their family members could be more efficiently engaged in the treatment process. Self-triage tools guiding patients to care system can improve person-centredness, user experience and efficiency of the care process.

4.4 Mapping of governance and information-sharing mechanisms

4.4.1 Mapping of governance at HNBP hospitals

Detailed methodology and approach.

Governance comprises the arrangements put in place to ensure that the intended outcomes for stakeholders are defined and achieved. The fundamental function of good governance in the public sector is to ensure that entities always achieve their intended outcomes while acting in the public interest.

An assessment of governance arrangements at HNBP hospitals was done using a combination of different methodologies. The selection of panel hospitals was similar to the staff and patient surveys described above in the report.

Several methods of information collection were used to conduct assessment of governance arrangements. Firstly, statutes of all HNBP hospitals were reviewed. Statute provides a legal regulation of governance and management principles of the hospital, including key responsibilities and work arrangements for the governing body. Based on our analysis of the statutes, several questions were identified, which were addressed later during the interviews with management and governing boards.

Secondly, interviews with supervisory and management boards of the six HNBP hospitals were conducted. Interviews with management and governance boards were conducted separately in order to avoid potential influence of views and thoughts on governance. The interviews were used as the main source of information collection and evidence finding for governance assessment. Interviews were designed based on the International Framework and Good Governance Practice in Public Services, developed by The Independent Commission on Good Governance in Public Services, UK.⁶⁹ The author organizations of the framework are The Office for Public Management (OPM) and the Chartered Institute of Public Finance and Accountancy (CIPFA).

Thirdly, agendas of board meetings of the six hospitals in the last two years were reviewed with an aim to assess how strategic is the governance practice and how performance of governance boards complies with the statute principles.

Findings and synthesis of the information collected is presented according to the structure of the Good Governance Practice in Public Services.

Key findings.

Good governance means focusing on the organization's purpose and on outcomes for citizens and service users.

⁶⁹ <https://www.jrf.org.uk/sites/default/files/jrf/migrated/files/1898531862.pdf>

- The clarity of the vision, strategic direction, and purpose of the hospital can be improved in governance practice in HNBP hospitals. Strategic input/expectations from the founders of the hospitals are too vague or missing, in order to guide the organization's intended outcomes for citizens and service users.
- There is little explicit evidence the governors are transparently making sure service users receive a high-quality healthcare service. Clinical governance, as specific feature of hospital governance, is irregular and not systematic.

The underlying role of governance is to ensure strategic direction and clarity of purpose for the organization, but also effective supervision of the organization's performance and support to executive management. HNBP hospitals have two strategic documents that guide their development – strategic development plan approved by the supervisory board and functional development plan approved by the Minister of Social Affairs.

- A strategic development plan is relevant document for both governing bodies, management and supervisory boards of hospitals. Strategic plans and implementation reports are regularly discussed and reviewed at supervisory board meetings.
- A functional development plan is used to define the medical areas the hospital is functioning in, and the potential areas for investment, or alternatively, defining the areas which have no perspective in the long run. Our interviews revealed that functional development plans exist formally, and supervisory boards do not consider these plans seriously. Members of the supervisory boards found it difficult to refer to the functional development plan content.

Current strategic development plans of the reviewed HNBP hospitals, which are available in hospital web sites, are lacking clearly defined strategic direction and measurable goals, and the strategic outcome can't be distinctively communicated. Strategies are far too general in content, mostly descriptive and narrative by nature, providing a combination of activities and development ideas, and often operative in character. Strategic plans of networked hospitals do not provide ideas about better coordination of services between the hospitals, re-designing patient pathways, or other value delivery for citizens/patients. Support to the process of networking of hospitals was expressed by the vast majority of the interviewees, however, the goals and outcome of the networking process are not defined, nor at national or in local and hospital level.

According to the feedback from interviewees, current governance practice of HNBP hospitals does not include hospital specific clinical governance. Supervisory boards do not receive, nor discuss regularly standardized reports on hospital service quality. There are irregular overviews on clinical issues or areas, but these reports do not replace comprehensive and transparent clinical governance needs. Many interviewees said that information shared to the supervisory board is framed by the management board and follows the "comfort zone". Members of supervisory boards, in general, are very modest to request comprehensive healthcare specific information as this exceeds their level of competence and confidence.

A general comment was made by both supervisory and management board members that overall stewardship and leadership by the Ministry of Social Affairs to lead and coordinate the process of networking and development of hospitals is vague, although there is a clear need for this.

Good governance means performing effectively in clearly defined functions and roles.

- Basic regulation of governance principles, functions and work arrangement of supervisory boards are appropriately described.
- The roles and responsibilities of governing and executive boards on the level of regulation are well distinguished and followed in their general activities.
- Supervisory boards mainly perform traditional monitoring and supervisory functions. However, modern governance requires functions beyond that – more leadership capacity is expected and mentoring support to executives is needed.

Regulation of key governance principles and governing body are described in hospital statutes. The structure and content of statutes of HNDP hospitals, including regulation of governance, are quite similar. According to the interviewees, both boards carry on their formal roles distinctively. Supervisory boards, as a rule, do not intervene into operational management of the hospitals. They mostly supervise performance of the hospital and take decisions of strategic nature.

Working arrangements between management and supervisory boards are organized in a balanced way, that satisfies both bodies. Despite general satisfaction with the roles, management boards expressed additional thoughts – from one side they expect supervisory boards to leave them enough space and freedom in operational performance, but at the same time more professionalism and initiative on governance level is needed.

A question, whether members of supervisory boards represent strategic views of founders and key stakeholders, was responded with hesitation. Founders and their representatives are not prepared to ensure clear inputs to hospital strategic management and protecting the needs and rights of served customers (community members, citizens, patients). Strategic management in the reviewed HNDP hospitals is guided therefore mainly by management boards. This can be identified as weakness of hospital governance practice, caused by modest role and low capacity of governing boards, and little value added to strategic guidance.

Predominantly, members of supervisory boards perform their supervisory function, focusing attention mostly on contract management with EHIF and that the hospital is economically sustainable. Modern governance roles of leadership and mentoring support to executive teams are not present in current governance practice in HNDP hospitals.

Good governance means promoting values for the whole organization and demonstrating the values of good governance through behaviour.

- Leadership by governing body and interaction with staff, in general, is a challenge.

Strategic development plans of hospitals define key values that are important for service delivery, and in managing the hospital. Unfortunately, and because of time constraint we had to limit us to interviews with supervisory boards and other assessments modalities were not available. Hence, we were not in a capacity to assess governing bodies' adherence to the set values.

Dispersed responses were received to a question, what are the values of the hospital. There were supervisory board members who were able to name the values and also many, who were

not. Few board members were rather recent in their duty that can explain not knowing strategic development plan of the hospital well enough.

We asked also whether the hospital's staff know you as a supervisory board member and whether there is a practice to organise events to demonstrate the leadership role by the board. Majority of the responses were rather hesitant, mostly saying there are no systematic and direct engagement of supervisory board members and staff.

Good governance means taking informed, transparent decisions and managing risk.

- The organization of governance arrangements is regular and in accordance with the regulation. The higher the level of the hospital is, the more active is the organization of governance practice.
- Risk assessment brought to the governors' attention has mostly retrospective character based on internal audit reports, prospective risk assessment of the hospital performance not so evident.

Governance functions of HNPD hospitals are performed mostly by hospital supervisory board meetings, which according to the regulation should take place at minimum four times a year. Supervisory boards execute their functions reviewing performance and financial reports, they hear and discuss areas of interest presented by the management board and they take decisions following the scope of their responsibilities.

Agenda protocols of the supervisory boards of the last two years indicate, that all supervisory boards have met the frequency requirement for board meetings, set by statutes of the hospitals. An observation can be made, that higher level HNPD hospitals supervisory boards meet more frequently than in lower level hospitals. For example, according to the recent practice supervisory board of NEMC meets ten to eleven times a year, compared to general hospitals, where supervisory boards meet in average four to five times a year. The frequency of supervisory board meetings at central hospitals remain between these two.

Due to the higher frequency of supervisory board meetings in NEMC the board have longer term planning of board meetings, when general hospitals mostly call for supervisory board meetings one month after each quarter passed. Agenda is often compiled and prepared by management board, with few exceptions when chairmen of the management and supervisory boards act together in planning the meeting. As a rule, supervisory board receive full agenda and documents to be discussed three days prior to the meeting.

Standard agenda items are quarterly reports, discussed usually in constructive and unanimous atmosphere. Several board members referred that due to modest competency of governors in "hospital business", they tend to not ask specific and deep dive questions about hospital performance. Discussions in general never gets hard nor agile, except few examples brought to us, when question was about closure of structural unit. Decision making, as a rule, is made based on consensus with very rare disagreement between board members. It should be mentioned that supervisory boards usually do not follow-up implementation of the decisions made by them.

In general, board members' feedback to the quality of reports, documents and draft resolutions for board meetings was satisfactory. They also referred that decisions are based on evidence and usually argumentation for decision making is satisfactory.

According to the recently introduced regulation all HNDP hospitals must have internal audit and risk assessment arrangements in place. Majority of the hospitals have introduced Audit Committees as a standing structure of the supervisory board. Members of the committee are usually board members, but in few occasions external auditors are engaged to strengthen audit capacity. Risk assessment function is mostly backward looking and not forward oriented, as assessed by governors. Governors are usually not informed in advance about potential risks, which may occur, and rather get information about past performance from audit reports.

Good governance means developing the capacity and capability of the governing body to be effective.

- Capacity and capability of governing bodies to ensure high quality HNDP hospital governance is a challenge. Supervisory boards of hospitals are dominated by representatives with political background, technical and professional healthcare management competencies are rare in governing bodies. The balance of skills, knowledge, experience for effective hospital governance is a concern.
- There are no clear criteria for board member replacement, renewal of the board membership and qualification requirements for board members. Sustainability of the board capacity to perform good governance may be a great challenge.
- Regular board performance evaluations, if these exist, bear rather formal character. The practice of critical self-assessment of governing practice by boards, as individuals and as a group, is rather irregular and not systematic.

HNDP hospitals in Estonia are publicly owned and the founders of hospitals are either government (in the capacity of the Ministry of Social Affairs) or municipalities. Members of supervisory boards are appointed by founder(s). Continuity and renewal of board membership depends often on political situation. A number of board members may change after national or municipal elections, questioning sustainability of governing quality.

Political representation in HNDP supervisory boards dominates over professional healthcare management representation. Absence of qualification requirements for members of supervisory board is a weakness of current governance practice. It was addressed during the interviews that more competencies in healthcare management are needed to strengthen governance practice of supervisory boards. Educational background and working experience of supervisory board members, without few exceptions, does not provide needed competencies and confidence in handling hospital governance issues in complex, from the economic, clinical, nor from broader healthcare management perspective.

Recent developments related to the networking of hospitals has changed partially the situation at the level of general hospitals. Regional hospitals, which have acquired control ownership of general hospitals have partially replaced members of supervisory board with managers and physicians from their own hospital. This change has potential advantages, if to consider strengthening the clinical governance and quality issues of hospital services. However, we should pay attention to a few other concerns, which may affect the governance practice.

- Firstly, physicians/medical doctors representing “parent” hospital interests are usually good clinicians, however, without earlier experience being involved in governing, economic and strategic management affairs. This does not necessarily ensure added value to the quality of governance.

- Secondly, clinicians of a “parent” hospital may have responsibility for guiding and supervising development of the general hospital, including service delivery and coordination. Having a mandate to supervise over their own clinical performance indicates a potential conflict of interests.

Another concern identified during the interviews was hospital supervisory boards not to pay attention to developing internal governance competencies. There are no systematic efforts to develop governance practices collectively, nor individually, even for new members of the board.

Time to time management boards make efforts to introduce to supervisory boards healthcare management and service delivery related issues, but this happens rather irregularly in overall and does not fill the gap of developing needed qualifications.

One of the characteristics of good governance is regular assessment of own performance by the governing body. Those HNPD hospitals, where the state government is one of the founders, compile annual governance performance reports and present them to the Ministry of Social Affairs and Finance. However, according to the feedback from the board members interviewed these reports are not discussed with care by the boards, nor there is feedback from the Ministries.

Good governance means engaging stakeholders and making accountability real

- Formal accountability of governors to the founders and key stakeholders is not introduced systematically. Reporting and feedback to founders bears rather irregular character.
- Governing practice of active engagement of other stakeholder institutions and communication with public is modest.

Members of supervisory boards are formally accountable to the founders they represent, either the government or municipality. However, practical arrangements how this should be organized are not defined and the governors interviewed found it difficult to explain. Members representing municipalities mentioned that according to the needs, but at least once in a year, they bring hospital management and governance status for the attention in the municipality council meeting. A general observation can be made that no systematic arrangements are set how founders execute their ownership and stewardship role, nor there are arrangements defined how appointed representatives (supervisory board members of the hospital) should carry on accountability to founders. It should also be mentioned that not all representatives of the founders are members of the municipal government or council, and because of that their relationship to the founder organization remains vague.

Hospitals are traditionally in the crossroad of interest of several stakeholders. According to the feedback from board members the stakeholders and their expectations are not defined, nor is provided regular feedback on hospital strategic performance to stakeholders, as a feature of accountability.

No systematic practice exists how governors or founder organizations communicate with citizens/patients in order to learn essential feedback and their expectations. Those board members, who represent municipalities, time to time meet with their constituency and certain issues related to hospital services are raised, however, this does not ensure systematic accountability to the public. There are very few occasions, where governors conduct press conferences or other public events.

4.4.2 Mapping of information-sharing mechanism at HNDP hospitals

Methodology and approach.

To evaluate the level of health data and information exchange in Estonian hospitals, the Health Information Sharing Maturity Model (HISMM)⁷⁰ was used. This method demonstrates the value of health and medical information sharing capabilities to stakeholders, identifies gaps of funding, and relates governmental activities to strategies and frameworks. The method divides maturity dimensions into three groups (Technology, People and processes, and Governance) and consists of 11 blocks of questions. The method was chosen to enable scoring of the current status and plans of the development against an aggregated system of capability dimensions and levels. In order to achieve the aggregated view, the method looks for the evidence or indicators of the capability in the data collected during the assessment.

This rapid assessment is based on semi-structured interview results where experts of the institutional, operational and technical levels are asked about Estonian digital healthcare information governance, health data flows, information security, and existing computerized information systems, services and tools. The analysis pictures the hospitals being a part of wider information sharing network. Hence, both internal and external information sharing participants were discussed. Specifically, interviews with the stakeholders touched the key processes for data management and usage, system architectures, database architectures, key relevant data sets, data exchange capabilities and system platforms available in the health system, taking into the account the current use of the Health Insurance Fund, the Nation-wide Health Information System and the National Institute of Health Development databases.

The information sharing network under discussion included health care institutions, public authorities, and other data users, e.g. researchers and patients (from the point of view of hospitals). As the interviews covered the involved participants in both data provider and data consumer roles, the captured evidence touches also the existing and potential use of data both in primary and secondary purpose. In multiple occasions the interviewed stakeholders were able to share insight of how health information exchange and services are integrated with the social and labour market services. The assessment covered key information systems, data sets and data exchange capabilities of the Estonian healthcare system.

In addition to hospitals, specialists from the National Institute for Health Development, the Estonian Health Insurance Fund and the Estonian Society of Cardiology were interviewed. Before the interview, the interviewees were provided with comprehensive set of questions divided into 11 topics of interest (Appendix 10). The length of interviews was 1,5-2 hours. Usually, the group consisted of 4-5 persons and included the head or vice-head of the institution, chief specialists of clinical, IT and service development, and health accounting and/or statistical departments. Total 9 interviews were conducted with 6 hospitals and 3 other organizations:

1. NEMC
2. TUH
3. Pärnu Hospital
4. Viljandi Hospital
5. Põlva Hospital
6. East Viru Central Hospital

⁷⁰ https://health.mitre.org/wp-content/uploads/2018/03/HIMSS18_Health-Information-Sharing-Maturity-Model.pdf

7. Estonian Society of Cardiology
8. NIHD
9. EHIF

The Ministry of Social Affairs gave feedback to the questionnaire in written form.

Below are the results of the interviews and the levels of maturity according to 5-point grading scale. The content reported below is based on the notes collected during the interviews; no additional input or opinion has been added into the interview results. The evaluation of the discovered evidence was done according to the detailed criteria available in Appendix 10. The general criteria of evaluation are presented in the Table 22. In some cases the evaluation resulted in multiple simultaneous maturity levels depending of the choice of specific scope, stakeholder, or data flow. Although, according to the HISMM methodology only the overall minimal level achieved could be reported, in some positions of the questionnaire the choice was made to report multiple simultaneous levels when it was easy to indicate the specific scope of additionally evaluated data dimension.

Table 21 Structure and criteria of the evaluation

	Level 1	Level 2	Level 3	Level 4	Level 5
	Target: project completion	Target: expertise reuse	Target: common standards	Target: performance achievement	Target: continuous improvement
Data Quality	Some sharing, minimal metadata, no quality metrics	Sharing from <50% available; basic defined metrics, basic process improvement, human readable	Sharing ~50% available, searchable within workflow, mainly structured, ad hoc quality measurement	Sharing 50%-70% available, daily avail, quality tracking and enforcement process	Sharing >70% available, process of ongoing data integration, near real-time or on-demand, computable interoperability score
Transport Standards	Custom, private, undocumented protocols	Documented, but non-standard protocols	Some documented and standard protocols, consistent application, protocol metrics collection	Mostly documented and standards based, consistent internal and external use	Only use of approved standards-based protocols
Data Security	Baseline EU compliant policies defined, ad hoc and manual implementation, admin role separated	Some repeatable and automated process of policy implementation, fully identified policies, management commitment	Fully automated: need to know, separation of duties, and least privileged; conformance tracking process; risk mgmt plan	Full automation of all policies; defined improvement metrics; risk management plan implemented	Security metrics tracked, enforced, and improved; all policies enforced; risk monitoring and improvement process
Interoperability Standards	Ad hoc direct calls between systems, ad hoc terminologies	Proprietary undocumented APIs for component reuse	Samples of standardized APIs and message/document models in use, some shared terminology	Standardized Application Programming Interface published, trained, and supported; terminology approval process	Only standardized and published APIs and terminologies in use
Usability and Workflow	Information in separate systems	Technical level sharing, but requires manual reconciliation; duplicate entry; areas of improvement identified	Some support for reconciled view and workflow; usability metrics identified; some automated usability control	Reconciled view with controlled quality; automated usability metrics; minimal data input	Real-time on-demand access to reconciled view; manual entry only for human decision; continual usability improvement
Process Alignment	Parallel implementation of same capability	Identification of overlapped capabilities	Business case development to reduce overlaps of capabilities	Ongoing efforts to reduce duplicated capabilities	Single common mechanisms per capability; continuous process of duplication avoidance
User Participation	<25% of potential participants enabled; poor actual use	<25% of potential participants enabled; good actual use	>50% of potential participants enabled; poor actual use (<75%)	>50% of potential participants enabled; good actual use (>75%)	>95% potential participants engaged
Consent Privacy	No consent; all or nothing general consent only	Provider scoped general consent	Data class scoped general consent	Access type (view, add, update, etc) consent	Participant scoped consent
Data Governance	No governance agreements in regards of data sharing	Data sharing governance agreements exists, but there is a lack of common basis for the agreements	All data sharing is based on common governance agreement	Defined quantitative measurement for assessing data sharing governance	Continuous improvement process of data sharing governance is in place
Stakeholders	No governance organization structure in place	Defined governance process, but not all stakeholders represented	All stakeholders included	Defined quantitative measures of governance process are in place	Continuous improvement process of data governance organization is in place
Sustainability	Uncertainty in funding over the next year, funding is unstable, inconsistent leadership support	Uncertainty in funding over the next 5 years, funding source is unstable, inconsistent leadership support	Certainty of funding over the next 3 years, consistent leadership support	Funding source is stable, leadership is engaging and providing direction	Certainty of funding over the next 5 years, incorporating as part of a mission

The chosen assessment method allows the conclusions from this initial rapid assessment to be further analysed to understand the architectural options for integrated data and information management. The levels of the applied Health Information Sharing Maturity Model include criteria, which guide towards further advancement of the capabilities. In the later phase of the study the terminology for potential improvement of information sharing is considered to be based on the perspective of the continuity of care framework of ISO13940 standard.

Findings and conclusions

TECHNOLOGY

1. Information and data quality.

- a. Is the data and information up-to-date, accurate, complete, relevant, etc.?
- b. Is the data suitable for information and decision making?
- c. Is the data suitable for meeting legal and contractual requirements?

Clinicians and healthcare providers.

Clinical data in vast majority is not collected in a well standardised or structured way in any hospital. Free text is mainly used to collect patient clinical data. Usually, regarding the clinical data collection, there is no uniform rule at the hospital level. Departments as well as hospitals decide their own rules internally. Generally, physicians or nurses take responsibility for their entered data and don't follow some specific taxonomy. Although the data set is affected by state-regulated standards, the data is rather unstructured. Some departments have more active employees who try to collect more data than the standard or software allows.

Hospitals are striving for a more standardized data through development of their information systems. Regional and central hospitals have more resources to work with data standardisation and they discuss, for example, about the use of SNOMED to register different types of blood pressure and other medical data.

Hospitals are looking for the state support to coordinate data standardization. Currently, the responsibility of data standards development and localization is shared between the developer and hospital clinical specialists. Developer is waiting for the terminology to be agreed, though, some of them have proposed a technical solution for terminology management. The direction is to involve clinicians in the development of the content of Electronic Medical Records (EMR).

There is no data exchange with other healthcare facilities for the same patient except through the Nation-wide Health Information System and the Estonian Healthcare Image Bank. However, this is mostly an exchange of the completed clinical activities only, not the data elements that can be used for clinical decision making.

The question is how to obtain health data at an adequate level of quality e.g. for Randomized Clinical Trials? In general, hospitals do not have resources to develop terminologies or conduct data quality monitoring. This leads to the lack of on-line or short-term monitoring of care quality, not speaking about the implementation of comprehensive digital decision support systems or aids for differential diagnosis.

Regarding the data for hospital management, there are several software applications for different administrative data. However, a lot of manual data entry is needed based on the reporting and statistics from EMR and administrative software.

The volume of medical services is monitored by management of the institution or department. As a rule, in one-month cycles. The workload of doctors and the fulfilment of hospital bed capacity are based on the EMR reports and human resource software. Hospital resource management during the normal period (not COVID-like situations) does not require very high efficiency. In most hospitals, the raw data are all electronic, but is manually transferred to various tables for reporting and statistics.

Integration with the EHIF data bases is not on-line, but it could be. The DRG reporting also distorts the actual volume of treatment cases.

LEVEL / KÜPSUSTASE 2

Healthcare services' planning, indicators and reports, and healthcare policy making.

Several regulations and annexes have been approved by the Ministry of Social Affairs about the requirements of data sets of documents transmitted to health information system⁷¹ or to medical registries. However, they define mostly general classes of clinical information to be collected, not terminologies for clinical data. For instance, SNOMED-CT is referred in pathology reporting only.

Health and Welfare Information Systems Centre (HWISC) performs quality control of submitted documents automatically. Reports on are available both in summary about all providers and for each healthcare provider separately. However, this control applies to the document standard not to the clinical content of the data elements in the document.

LEVEL / KÜPSUSTASE 2

Public health data and research. National Institute for Health Development (NIHD).

NIHD collects most of the data from health care providers in aggregated form through internet portal A-Veeb. The data collected include: health care services (outpatient visits, hospital discharges, emergency care, surgery, dental care, diagnostics and therapeutic procedures, etc.), resources (hospital beds, medical devices, health care providers' economic activity, etc.), morbidity and the number of breastfed infants. The data collection order comes from the MoSA. Data collection forms are defined by legal regulations. Each register has their own copy of the ICD-10 coding. The coding is adapted for international statistics. There is recently established working group for the management of terminology (MoSA, NIHD, HWISC, NHIF). The aim is to bring together terminology developed by disciplines and other parties.

The data entered by doctors is often in free text that cannot be automatically transferred to the NIHD database. The collection of health statistics data differs by type, depending on the report or indicator needed. Data is generally submitted once a year. The quality of the data collected is uneven. The purpose of Estonian nation-wide Health Information System has been to exchange document data that is not optimal for statistics. If the data comes directly from the laboratory, the quality is good. When the description of the activity goes through the doctor, there is a great variability in the quality.

NIHD administers six population-based registers and databases. NIHD is increasingly trying to switch to automatic digital data exchange. For example, the Estonian Cancer Register, where the North Estonia Medical Centre (NEMC) is the first to start a digital data exchange. Other

⁷¹ <https://www.riigiteataja.ee/akt/110042020004>

medical institutions are still on paper. NIHD can compare its data with the NEMC and TUH databases. The Causes of Death Register is electronic (e-death). Receives data from EHIS. The Estonian Cancer Screening Register also tries to retrieve data from the EHIS, but unfortunately only half of the data reaches the register⁷². Only a few medical institutions are able to send electronic data properly.

The data quality in NIHD registries is very good as the data received from health care providers are controlled, cleaned and standardized by NIHD specialists. The NIHD collects health statistics at the Estonian level from healthcare providers on the basis of a different regulatory acts of the Minister of Social Affairs. The tasks include data verification, processing, analysis, archiving, publication of Estonian health statistics and methodological development. In addition, the NIHD represents Estonia in the field of health statistics at international organizations (WHO, OECD, Eurostat) and forwards Estonian data to these organizations every year.

LEVEL / KÜPSUSTASE 4 – Concerning data quality in registries

LEVEL / KÜPSUSTASE 2 – Concerning data Exchange between NIHD and healthcare providers.

Financial Reporting and Invoicing Data.

For the financial reporting of provided health care services a healthcare institution must follow the rules set by EHIF. EHIF has defined list of services which are reported through electronic channel.

Regarding the clinical data, they exist in part. The problem is that the data model based on encounter model is too rigid – the flow of data is through finished cases only. The actual data quality needs to be clarified. The issue of semantic interpretation of events is not designed through data.

LEVEL / KÜPSUSTASE 3

Patient.

The Patient Portal of EHIS⁷³ is used to share person's individual medical data. This is the same data that is available for healthcare professionals. There is only one form dedicated for the individual person to enter own health data – Health Declaration. This is for the health certificate application.

The proposal by the interviewees was that EHIS should also collect from a healthy person other data than Health Declaration. Both the disease-specific and self-monitoring data capture, sharing and archiving is required.

LEVEL / KÜPSUSTASE 2

⁷² NIHD communication; [Evelin Anion, Master's Degree, 2018, \(sup\) Piret Veerus, Analysis of selected quality indicators in the Estonian cervical cancer screening program in 2016, Tallinn University of Technology School of Information Technologies, Department of Health Technologies.](#)

⁷³ <https://www.digilugu.ee>

2. Technical data exchange capabilities between institutions

- a. Are data transport mechanisms defined, targeted, defined, described, communicated, tested, audited and controlled?
- b. Do data transport solutions cover the needs of data exchange between systems?
- c. Are data transport rules transparent to users?

Clinicians and healthcare providers

All healthcare providers are using EMRs. Clinical data exchange inside the hospital is secured by EMR – health care specialists from different departments can easily follow care pathway of the patient. The clinical data exchange between hospitals goes through EHIS that is managed by HWISC. Images, image reports and graphs (like ECG-s) are shared through the Estonian Healthcare Image Bank. Both institutions have set clear standards for data exchange (HL7, DICOM) and documents for transport mechanism are available for healthcare providers and EMR developers.

Data exchange inside a health care provider's organization between EMR and medical equipment (laboratory, radiology, endoscopies, etc.) is mostly automatic, which is rare case inter-organisationally. Although, in some extent existing between some health care providers, and smaller hospitals and the Estonian Healthcare Image Bank.

For communication with EHIS, X-road or X-tee⁷⁴, a secure data exchange platform is used. From the perspective of reporting and data exchange between a healthcare provider and EHIF, the data flow to EHIF is well defined and automatized but not in opposite. The process of creation of sick leaves is automated. Invoices to EHIF are usually formed or at least controlled by medical statistics and/or billing unit including substantial amount of manual work.

For the management of non-clinical data hospitals have several information systems which are usually not integrated between each other, neither with EMR. The more monolithic a hospital information system is the more are there integrations in the institution (e.g. TUH, central hospitals).

Estonia is lacking evaluation criteria and process of EMR-s. The only environment for EMR testing is the EHIS test base.

LEVEL / KÜPSUSTASE 4

Healthcare services' planning, indicators and reports, and healthcare policy making. Public health data and research.

Data exchange between hospitals and governmental or public organizations is one-way traffic – hospitals are obliged to provide data according to set regulations not having a possibility to get feedback from the data recipient. The data reporting from data providers side is solved by web-portals (A-veeb) or specific forms in excel or other formats.

The rights and possibilities of accessing data from registers and databases are described in their statutes. For example, the EHIF database can only be accessed by a health care provider which is in contractual agreement with EHIF for a healthcare service provision, medicine or medical device reimbursement to an insured person. In addition, for example, the Cancer Register describes that the chief processor shall publish statistical data compiled on the basis of the

⁷⁴ <https://www.ria.ee/en/state-information-system/x-tee.html>

register data on the website of the agency in a non-personalized form, so, there is no feedback loop from the registry to healthcare provider.

LEVEL / KÜPSUSTASE 2

Financial Reporting and Invoicing Data

Data exchange with EHIF is electronic. The transfer of data has been agreed from hospitals to the EHIF. Feedback from EHIF to hospitals is not automated (for example, if hospital's contract volumes start to fill up, it must be monitored by the hospital, there will be no automatic notification from EHIF).

LEVEL / KÜPSUSTASE 3

Patient

The main data source for the individual person/patient is Patient Portal of EHIS. However, also some hospitals have developed their patient portals to provide customers with some health data and additional services. Portals are not integrated, neither there is data exchange between of them.

LEVEL / KÜPSUSTASE 3

3. Security

- a. Are data security and IT security defined, targeted and managed?
- b. Are data security and IT security mechanisms defined, specified, communicated, tested, audited and controlled / managed?

Clinicians and healthcare providers.

Most healthcare providers have applied proper data protection measures. There are few healthcare institutions that are not regularly using two-factors user identification. At the same time, authentication with ID card and mobile-ID is possible in all institutions, but it is not always used. For example, one reason for this is that the terminal servers do not allow to use of an ID card. Hospitals have firewalls and networks are segmented. Warnings of the State Information Systems Authority (RIA) are monitored, including on subject of phishing/scam letters. All regional and central hospitals have adequate security policy management. In some hospitals, the security specialist covers both physical and IT security. Documentation of IT security principles is available on the intranet of hospitals. IT audits have been performed or are planned to be performed. However, audit recommendations can be sometimes very expensive. Most hospitals use cloud services to a very limited extent. There are available own mail servers, Office365 licenses, etc.

Access to websites is restricted, e-commerce is usually closed. However, Facebook and LinkedIn are open. The direction is that users' computers are centrally managed, USB ports are generally disabled. Hospitals pointed out that it is not clear at the national level what is the level of data security in different institutions, so general security in other institutions can be a problem.

LEVEL / KÜPSUSTASE 2 LEVEL / KÜPSUSTASE 4 AND 5

Healthcare services' planning, indicators and reports, and healthcare policy making. Public health data and research. Financial Reporting and Invoicing Data.

The data protection of the registers is ensured through legal regulations. For example, there is a statute of the Estonian Medical Pregnancy Information System, which stipulates that information system data protection is ensured by assessing availability (K), integrity (T) and confidentiality (S) parameters according to national information system security measures, implementing organizational, physical and IT security measures. The security class of the information system is K1T2S2 and the security level is medium (M). This example applies to all state-owned registries or data repositories.

In NIHD, registry data is personalized, A-veeb data is anonymous. Data is obtained from the EHIS once a year, personal identification code has been replaced, pseudonymized. EHIF data is also non-personalized, but at the case level. Within the NIHD, access to premises and databases is regulated. The servers are located in NIHD. For employees, access to the external website is not regulated, for correspondence is Office365.

LEVEL / KÜPSUSTASE 4 AND 5

Patient.

Both EHIS Patient Portal and patient portals of hospitals have high level security measures.

LEVEL / KÜPSUSTASE 4 AND 5

4. Interoperability

- a. Are data transmission and query services or messaging services (API, interoperability standard) defined, specified, tested, communicated, audited and controlled / managed?

Clinicians and healthcare providers

Inside healthcare institutions the data transfer is automated. However, for internal data exchange EMR developers are using legacy solutions. To exchange data with other institutions demands development of integration services which is costly. The specification of integration standards with other information systems or medical equipment is provided by the EMR developer. Outside the institution the data transfer and interoperability are well standardised with EHIS, the Estonian Healthcare Image Bank and EHIF database. This is secured either by international standards (HL7, DICOM) or integrations developed by EHIF. All other information systems, with few exceptions (e.g. Cancer registry integration between NEMC and NIHD) exchange data and information using legacy solutions. In some cases, e.g. state owned registries, the data is transferred in Excel sheets or even by fax.

It is difficult to monitor the different dynamics of patient outcomes between institutions. EMR shows activities inside the hospital but to find relevant encounters or hospitalizations from the Digilugu is cumbersome. For instance, there are no interoperable pregnancy cards. Also, to find if the patient had imaging or ECG, the user has proactively to check the Pildipank to see if any images have been taken, there are no alerts in the EMR. If the patient cannot remember that an examination or procedure has already been performed somewhere, then there is a problem: one has to look in several databases.

There is a lack of coordination of data exchange standards and taxonomies at national level. For example, no one can decide which version of ICD is in use currently. Most of the lists of classifiers are in the HWISC pub centre. The information system itself synchronizes, the IT manager can check for updates and can synchronize.

As for the non-clinical reporting parameters, the information view and terminology can be tuned within the hospital in terms of house parameters (e.g. bed types and numbers). Hospitals submit different statistical data separately, different data are presented to data consumers with different Excel sheets, in some cases also automatically, for example, some hospitals have the personnel report of Statistics Estonia automatically from their information system.

As far as the formalization of data exchange in hospitals is concerned, day-to-day activities are focused on practical solutions. It is not formally defined which standards or broad-based agreements are applied in the management of data services or how activities related to the management of data services are controlled and influenced. However, all healthcare providers have quality manuals where often it is described how information related to data services is shared and where it is located in intranet.

LEVEL / KÜPSUSTASE 3

Healthcare services' planning, indicators and reports, and healthcare policy making. Public health data and research.

The data collection procedure is defined and published or regulated by legal acts according to the purpose of data usage. The data standards for digital data exchange between hospitals and MoSA, the Statistics Estonia, research institutions and/or NIHD are not established, which means that data exchange is not automated with any of above-mentioned organisations.

LEVEL / KÜPSUSTASE 2

Financial Reporting and Invoicing Data.

Cross-referencing of EHIF data is limited. EHIF does not automatically access EHIS or NIHD data. As the EHIF often asks hospitals for evidence, access to them must be ensured by the contractor, the hospital. Often medical records even come on paper. Collaboration requires the ability to understand hospital data, and it is often necessary for an EHIF specialist to visit a hospital and work with hospital statisticians.

LEVEL / KÜPSUSTASE 2

Patient.

The data exchange between Patient Portal and healthcare providers are clearly defined through the processes of EHIS. Therefore, data in Patient Portal has similar structure as in Electronic Health Record of EHIS. Individual person has several options to view own or trustee's medical data, invoices submitted to EHIF for the treatment, book appointment, manage access rights and make statements of intentions.

Unfortunately, the individual person/patient has no chance to send data from personal information systems, activity monitors or similar to patient portal or retrieve information from Patient Portal to third party applications.

LEVEL / KÜPSUSTASE 3**PEOPLE AND PROCESSES****5. Usability of information governance systems and workflow**

- a. Is the ease of use of information systems defined, tested, audited and controlled?
- b. Is the view of the use of information systems connected to the (clinical) workflow?
- c. Is the information use / flow workflow defined, specified, tested, communicated, audited, and controlled / managed?

The user-friendliness of EMRs is universally modest. As there are four different EMRs in Estonia, the preferences of users are also different. Users feel more comfortable with the systems they are familiar with. At the same time, there is a desire for the user interfaces to be similar or even for one EMR to be used all over Estonia. There is no common standard defined for EMR User Interface or User Experience.

A common problem is the high number of clicks. Also, the IT terminology used in EMRs is contradictory, for example "back" does not always mean back. It is difficult to understand in EMR exactly what has been done and when. Repeated logins, searching for data from different places, searching for some data from free text (blood pressure, weight) are common. Care guidelines are in separate files, not integrated into the EMR. There are even examples where nurses browse guidelines written in folders. There are too many windows in EMRs, timing errors cause messages that cannot be understood. There are a lot of boxes – don't understand what's important. Transferring data from one document to another is difficult, although the data should accompany the patient. The problem with the Helpdesk is that it can't predict where another user is stuck, has too many unexpected windows, and doesn't always understand whether you're working at the hospital, department, or patient level.

There is no monitoring of the patient's health or treatment goals anywhere in the information systems. It is also not possible to set alert thresholds or inform nurses about events that require intervention.

Although there were many complaints about the deficiencies, users did not rate the usability of EMR below level 3. Hospital staff seem accustomed to their ERMs and are wary of criticizing them, despite the user's day-to-day problems. For financial decisions, only contract data is available that is not synchronized between systems.

In regional and central hospitals clinical specialists are involved in the development of the information system. At the same time, the concept of user interface development, the workflow of information pathway or the expected compliance of the functions of information systems with the work process have not been defined separately.

LEVEL / KÜPSUSTASE 3**Healthcare services' planning, indicators and reports, and healthcare policy making. Public health data and research. Financial Reporting and Invoicing Data.**

As described above, healthcare providers have very few options to automatically send or receive data to or from MoSA, NIHD, EHIF or other databases and repositories. The reports,

indicators and aggregated data from medical, financial and public health repositories are achievable through the web sites of corresponding institutions.

As far as communication with NIHD is concerned, there are isolated attempts to make point-to-point integrations. For example, North Estonia Medical Centre sends Estonian Cancer Register data electronically.

LEVEL / KÜPSUSTASE 3

Patient.

There have been surveys conducted about the usability of Patient Portal. For example, in a survey conducted in 2015⁷⁵, 79% of visitors were satisfied with a visit to the patient portal. Estonian residents consider to be the most important on the patient portal the opportunity to view their own health data (47%) and answers to laboratory tests (41%), register for a doctor's appointment (35%), view a digital prescription (33%), process and digitally transmit various medical documents (27%), and view the health records of their family members (especially children) (25%). 79% of the population would like to see queues for treatment in different medical institutions and different doctors on the patient portal. 47% of the population considered it necessary to create applications that would allow them to collect their own health data (blood pressure, blood sugar, body weight, etc.) and pass them on to their doctor.

LEVEL / KÜPSUSTASE 3

6. Alignment and duplication of processes

- a. Is the landscape of data services and application functions defined, organized, communicated, audited, and controlled / managed?

Clinicians and healthcare providers.

At the hospital level, the activities and processes for entering and using clinical data are relatively well defined and duplication is not a problem. Though, it can happen that several users make the same entries or subscriptions in parallel. Some individual locations in the EMR are locked and you can see that someone is making changes at the same time. There are no warnings about duplication of studies or analyses. There are alerts of drug-drug interactions, but not for over-the-counter drugs and hospital-administered drugs. Warnings for specific diseases, e.g. infectious disease warnings are available.

At present, the laboratory cannot compile different referral letters and reduce blood sampling. Duplication in radiology is also possible if both the family doctor and the hospital order. The patient can go again with the referral letter, as some of the referral letters are still on paper.

LEVEL / KÜPSUSTASE 3

Healthcare services' planning, indicators and reports, and healthcare policy making.

Public health data and research. Financial Reporting and Invoicing Data.

⁷⁵ https://www.sm.ee/sites/default/files/content-editors/Uudised_pressiinfo/arstiabi_uuringu_aruanne_2015_tnsemor_16122015.pdf

The requirements to report the same data to different state and public authorities is an issue. Healthcare providers fill in often the same data in different forms and structures.

LEVEL / KÜPSUSTASE 2

7. Participation and access to information

- a. Are all actual and potential users and recipients of information systems and data known and described? Are users' data needs identified, specified, validated and assessed?
- b. Are users' actual data use defined, measured, audited, communicated and controlled / managed?

Clinicians and healthcare providers.

Roles are assigned by the hospital administrator in accordance with the hospital's instructions taking into account legal regulations⁷⁶. In general, there have been no cases of misuse of data by other professionals. The department manager must order the employee's rights, if there is use of data between departments, then the head of another clinic must also confirm. Patient inquiries are issued on paper.

LEVEL / KÜPSUSTASE 3

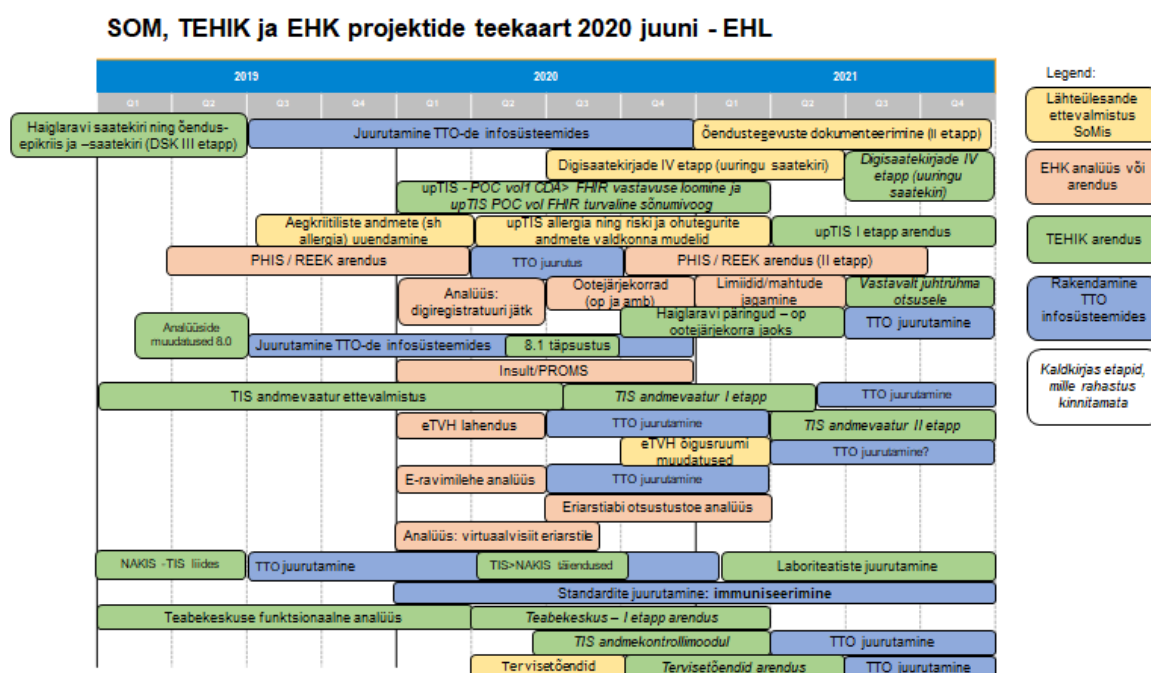
Healthcare services' planning, indicators and reports, and healthcare policy making.

Public health data and research. Financial Reporting and Invoicing Data.

Healthcare providers are occasionally involved in the planning of e-health services development or healthcare data digitalization. This is done through the involvement of Estonian Hospitals Association or specialists societies. An example of e-health project planning and prioritization is presented on the Table 22 below.

⁷⁶ <https://www.riigiteataja.ee/akt/117052020012>

Table 22 MoSA, HWISC and EHIF IT projects' road map as of June 2020



Patient.

In some hospital patient portals, a person can fill in their own contact information, in some places also a headache questionnaire. There is great interest about the anamnesis, questionnaire and diary. Pain management, oncology, and psychiatry also plan to share information with the patient.

LEVEL / KÜPSUSTASE 2

8. Consents and privacy

- Can patients (data subjects) or patients' legal representatives be involved in deciding on the handling of patient data?

Clinicians and healthcare providers.

Diverse because of different processes in healthcare institutions. Patient consents are on paper in the hospitals. In EMR-s, the patient cannot close anything directly. This is completely different from EHIS, where the opt-out principle applies, and the patient can close different documents. However, in some information systems, for example, there is a possibility to close psychiatry data, therefore it should be possible to close other data as well.

The problem is communicating with social workers, as they do not have access to EMR or EHIS. Hospitals, if necessary, communicate with the social worker of the municipality and try to create a social workers position in the house who would take over the management of these processes. It would be desirable if the social worker could also see certain data. At present, monitoring the quality of social services is not in place. A home nursing delivery referral letter has been introduced, where the social worker would also see certain information. It should be

possible to indicate the rights of access to the data, but this is not the case and the doctor does not know what the social care opportunities are. In fact, a person also needs care equipment, food, etc. It would be easy for the doctor to give recommendations about social needs. The family doctor should also receive a signal about the patient's needs.

LEVEL / KÜPSUSTASE 4 LEVEL / KÜPSUSTASE 3 LEVEL / KÜPSUSTASE 2

Patient.

Clearly defined rights for medical data use in Patient Portal. No chance to track the use of anonymized personal health data by research organizations, public health authorities or other third parties.

LEVEL / KÜPSUSTASE 3

9. Data governance

- a. Is data governance defined, defined, targeted, empowered, decided, audited, communicated, and controlled / managed?

Clinicians and healthcare providers

Hospital treatment policies and guidelines are available in all interviewed hospitals. Documentation of certain data is mandatory and technical checks are carried out. Clinical content control is a matter for the department or person responsible for the clinical work. However, there are many exceptions to clinical practice, so full structuring of the work is not envisaged – there are many clinical variations and some creative freedom must be preserved. For example, a case could be closed without the TNM Classification of Malignant Tumours, although it is mandatory in terms of treatment. Different training and management of clinical guidelines and protocols vary between hospitals and departments. At the same time, only a few protocols have been implemented in EMRs (e.g. treatment of a septic patient, multi-disciplinary meetings (in Estonian: *konsiliumid*), etc.).

As a new feature, Hospitals Association, EHIF and HWISC agree on a common roadmap. It is necessary to decide on the priority of data quality as so far the priority has been the registry, death register, etc. The digitization process of the hospital is not a priority at the national level and data quality is also depends on it.

The data governance differs from institution to institution being more formalized in regional and central hospitals.

LEVEL / KÜPSUSTASE 4 LEVEL / KÜPSUSTASE 3 LEVEL / KÜPSUSTASE 2

Healthcare services' planning, indicators and reports, and healthcare policy making.

Public health data and research. Financial Reporting and Invoicing Data

There is a confusion about the responsibility of the development, localization, publication and maintenance of different medical and health related taxonomies. For instance, hospitals and governmental institutions have no confidence where are the official versions of classifiers? Most are in the HWISC pub centre, but outside of it the versioning is not transparent. The information system developers itself synchronize the coding lists and the IT manager of institution can check for updates and can synchronize, if needed.

At the national level, hospitals are expecting that management of taxonomies and standards would be coordinated better by the state, which is currently lacking. For example, no one can decide which version of ICD-10 is in use, no one can remember where the SNOMED license agreement is, no new terminology can be addressed. The question is, who should govern standards at national level? Possible variants are the Institute of Clinical Medicine in Tartu University, societies of clinical specialties, etc. An example from experience is how the NCSP was created under the leadership of surgeons and made mandatory by the EHIF. MoSA is currently collecting hospital proposals for innovations, but the NIHD, for example, is also in need of common agreement because it is required that they submit data to the WHO.

LEVEL / KÜPSUSTASE 2

10. Stakeholder governance

- a. Are the parties involved in the organization's communication defined, specified, involved, communicated and controlled / managed?

Clinicians and healthcare providers.

Involvement of different parties in software and ICT decisions in hospitals is diverse also in this category. Activities are based on the decisions of management of the hospitals and the corresponding clinics within the hospitals, sometimes a specialist society or department initiates the preliminary analysis and the procurement process. In larger hospitals, departmental proposals are first collected. According to the readiness of the clinical personnel, the tasks go to the developer.

Coordinated cooperation and placement of development resources in the hospital are sought.

The organization of substantive IT development varies from hospital to hospital. Even if the same software is used, duplicate developments are made. Larger hospitals generally lead the EMR development process. Priorities also depend on the capabilities and management of the software developer's company. All Estonian hospitals purchase EMR development from outside the house. The exception is NEMC, where there are also some developers in their house. Developments from outside the hospital are primarily related to the monitoring of changes in the legal regulations. In EMR development process, external requirements must be taken into account at all times, which is why there is no time and resources to listen to and develop the wishes of doctors, nurses and other clinical staff. NHID records are difficult for doctors to make, you need an assistant to do it for doctors.

It is necessary to decide on the priority of data quality. So far, the priority has been the registry, Estonian Causes of Death Register, etc. The hospital's digitization process is not a priority at national level, and data quality is behind it.

Regional hospitals are looking for coordinated cooperation and the allocation of development resources to hospitals. Hospitals' internal innovation funds should be coordinated together. Especially in projects funded by the EU. Previous experience in standardizing the data content of EHIS and the EHIF price list has been such that not a large procurement was made, but to some extent all parties contributed their resources.

LEVEL / KÜPSUSTASE 4 LEVEL / KÜPSUSTASE 3 LEVEL / KÜPSUSTASE 2

Healthcare services' planning, indicators and reports, and healthcare policy making.

Public health data and research. Financial Reporting and Invoicing Data.

The data collected by EHIF and the data collected in HWISC are largely incompatible. It is not clear, for example, how the ICD-10 code will be generated for EHIF invoices and for Digilugu - the process is not unambiguously similar.

LEVEL / KÜPSUSTASE 2

11.Sustainability, incl. investments

- a. Are the organization's data exchange activities sustainable?
- b. Has the organization defined, defined, validated, decided, empowered, audited, communicated, and controlled the sustainability of its data exchange?

Clinicians and healthcare providers.

Budgets are limited, but also IT skills and clinical input are largely lacking. There is a problem with the provision of clinical input resources for IT, specialists are needed for the analysis of clinical needs. Larger hospitals refer clinicians to IT teams, which in turn reduces clinical resources. Decisions on the IT budget are ongoing, as a rule there are no longer-term perspectives.

The vision for hospital IT development is in place in most of hospitals at the management level, but it is not unambiguous in writing. The strategy exists to some extent. From the IT point of view, the strategy seems a bit distant, probably because of the operational pressure is great. For example, increasing the number of mobile workstations for nurses is a multi-annual strategy. IT development plans in hospitals have been permanent but made only in a one-year perspective. The problem is the digital addiction of the hospital. Plan B should also always be available when EMR is not working. Experience to date has shown that preparedness must be at the hospital level, as there are disruptions in centrally implemented systems.

LEVEL / KÜPSUSTASE 3 **LEVEL / KÜPSUSTASE 2**

Healthcare services' planning, indicators and reports, and healthcare policy making. Public health data and research. Financial Reporting and Invoicing Data.

The activities of HWISC give the impression that HWISC has ideas, but no money in the budget. The concern is that the government does not take into account the costs incurred due to the accompanying changes in the hospital. This applies to changes in legislation, the EHIF price list and the data composition of registers. The costs of a comprehensive change, including hospital changes, should be coordinated at the national level.

From a positive point of view, all government agencies have incorporated digital processes into their data flow, which makes further investments to digital data and processes development inevitable.

LEVEL / KÜPSUSTASE 4 **LEVEL / KÜPSUSTASE 3**

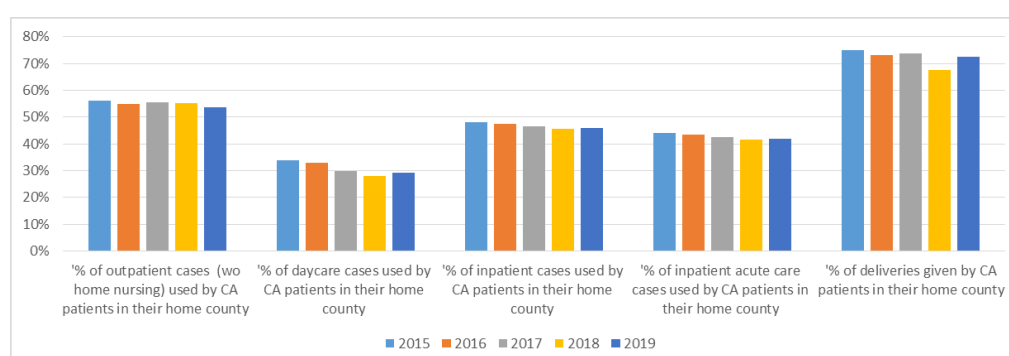
4.5 Detailed analysis of selected general hospitals

In the course of financial sustainability analysis, a set of hospitals that demonstrated financial fragility were selected for more detailed review. The aim of the review would be to prepare input for the next steps in the assignment, in particular for preparing policy scenarios during Q1-2 2021. For this more detailed profiles of 6 hospitals that obviously will need to be looked in more specifically in terms of sustainability and cost-efficiency of current service case-mix and financing model.

Järvamaa Hospital

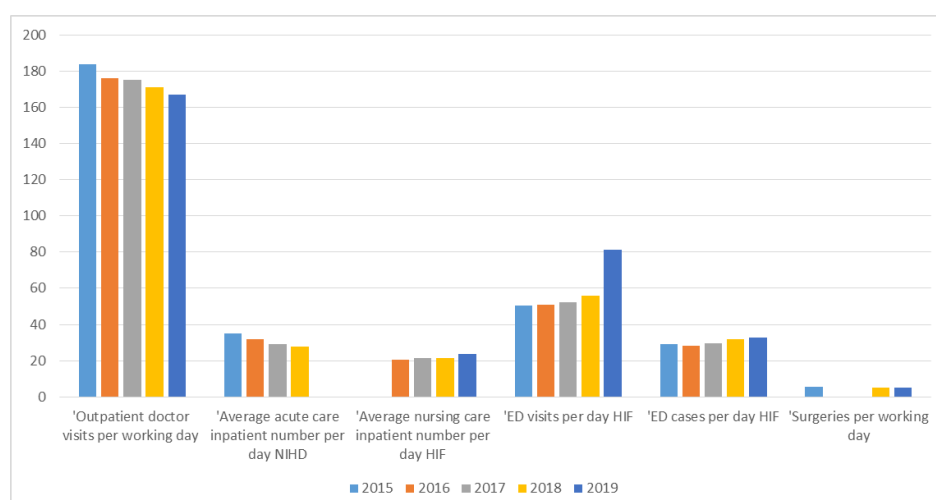
Catchment area (CA) of Järvamaa Hospital is 31 thousand people and has decreased 14% since 2004 but increased 3% in the last 5 years. The number of 65+ has increased 32% compared to 2004. More than half of outpatient visits of Järva County habitants take place in the home county of patients. The share of health care services, incl. deliveries, provided outside the county has decreased in some extent during 2016-2018 but still over 50%.

Figure 43 Järvamaa Hospital. Share of services delivered for the population in their home country



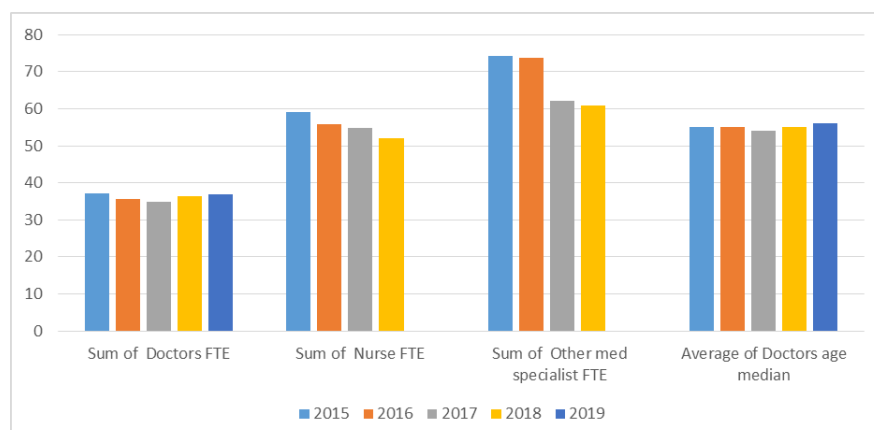
Järvamaa Hospital is located ca 90 km from both regional hospitals. The connection to both centres, however, is good as the hospital is at Tallinn-Tartu motorway. In 2019 hospital provided app. 5 surgical cases per working day in average, 1/2 of which were day care surgeries. There were 32 ED cases per working and in average 30 acute care inpatient patients (trend decreasing) and ca 20 nursing care patients (trend increasing) daily in hospital in average.

Figure 44 Average workload per day in Järvamaa Hospital



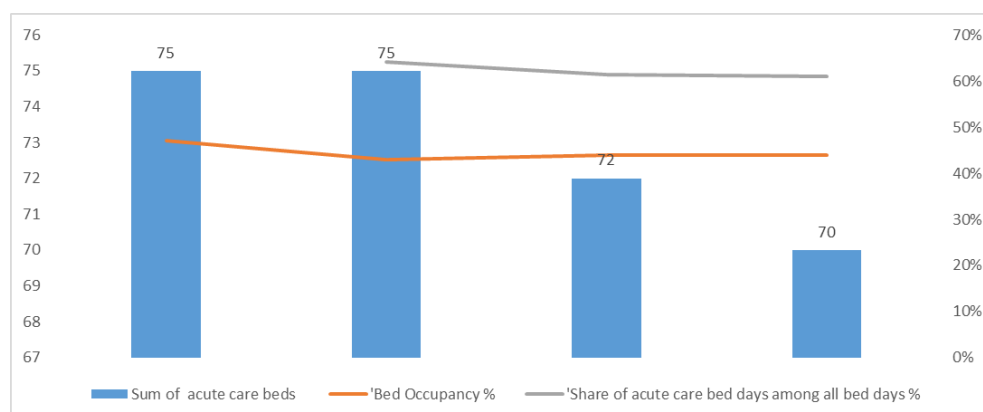
The number of doctors' FTE in Järvamaa Hospital is higher than in similar general hospitals and has been stable since 2015 (age median of doctors is ca 55 years).

Figure 45 Medical staff FTE-s at Järvamaa Hospital



Although, there has been a substantial decrease in the number of acute care beds from 75 to 70 in 2015-2018, the bed occupancy is still extremely low (44% in 2018). The 24 nursing care beds had 89% occupancy in 2018. In addition, the hospital accommodates 36 social care beds.

Figure 46 Järvamaa Hospital. Number of beds and bed occupancy 2015-2018

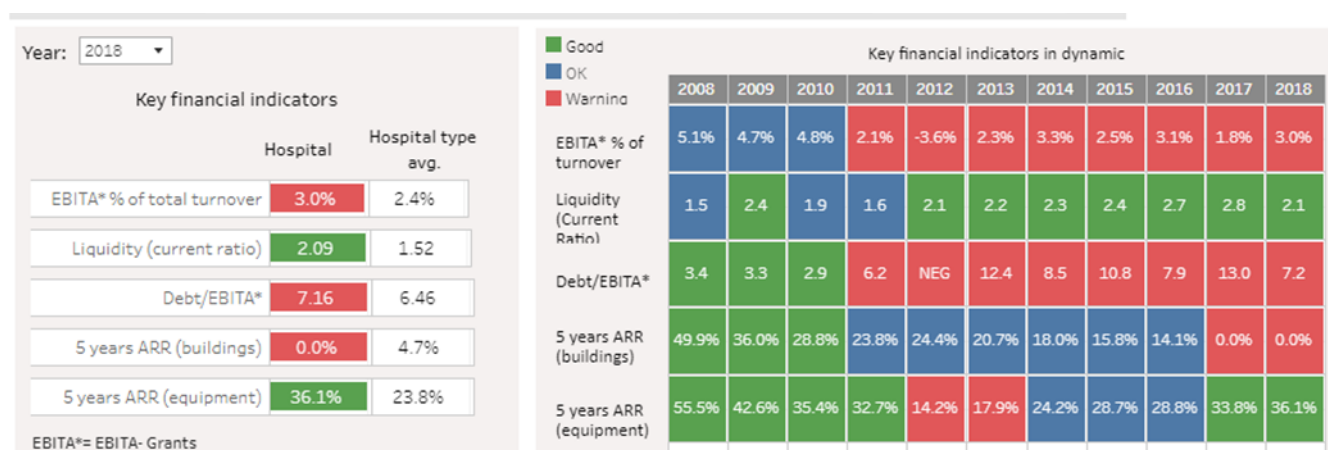


The hospital is located in seven separate buildings in the same campus. The main building is from 1970. In 2012 EU structural funds supported renovation of rooms for nursing care provision was accomplished and in 2017 an additional investment was made to create a health centre.

In 2015 -2018 the share of medical personnel cost in operating costs has increased from 47-52%. Non-medical personnel cost has decreased from 26 to 21% of operating costs.

Since 2011-2018 Järvamaa Hospital have had a low EBITA* margin (% of turnover) and a red zone Debt/EBITA* ratio.

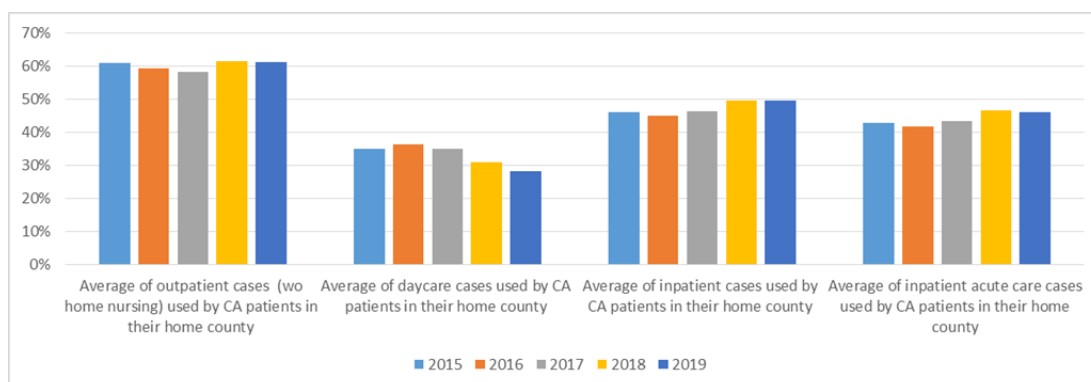
Figure 47 Financial sustainability evaluation of Järvamaa Hospital



Läänemaa Hospital

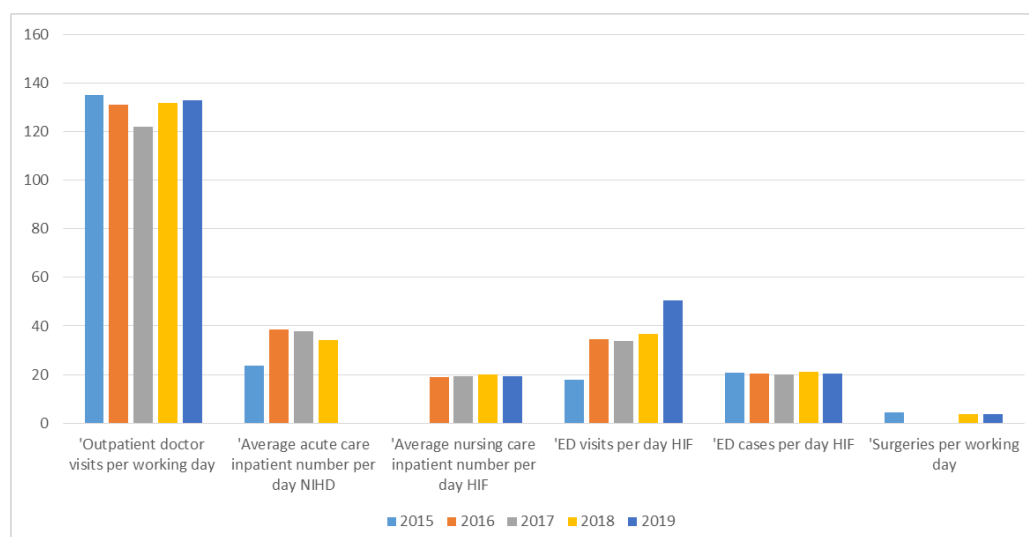
Catchment area (CA) of Läänemaa Hospital is Lääne County with ca 42 thousand people and the population has decreased 24% since 2004, although the 65 and older population has increased by 14%. More than 60% of outpatient visits of Lääne county habitants take place in the home county. The share of day care cases that took place in the home county has decreased gradually during 2016-2019 on the background of consolidation with North Estonia Health Centre in 2015.

Figure 48 Läänemaa Hospital. Share of services delivered for the population in their home country



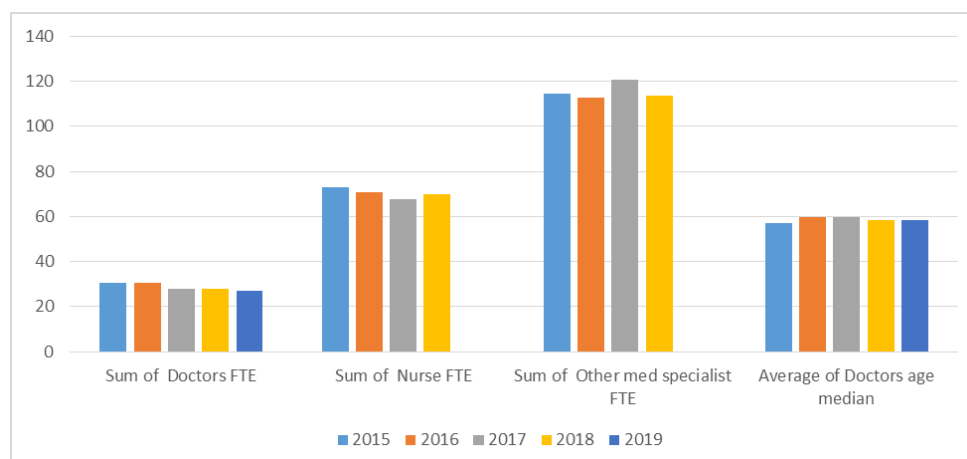
Läänemaa Hospital is located ca 100 km from North Estonia Health Centre. In 2019 hospital provided app. 4 surgical cases per working day in average, 1/2 of which were day care surgeries. There were 20 ED cases per working and in average 34 acute care inpatient patients (trend decreasing) and ca 20 nursing care patients (trend increasing) daily in hospital in average. Hospital does not provide delivery services.

Figure 49 Läänemaa Hospital. Average workload per day



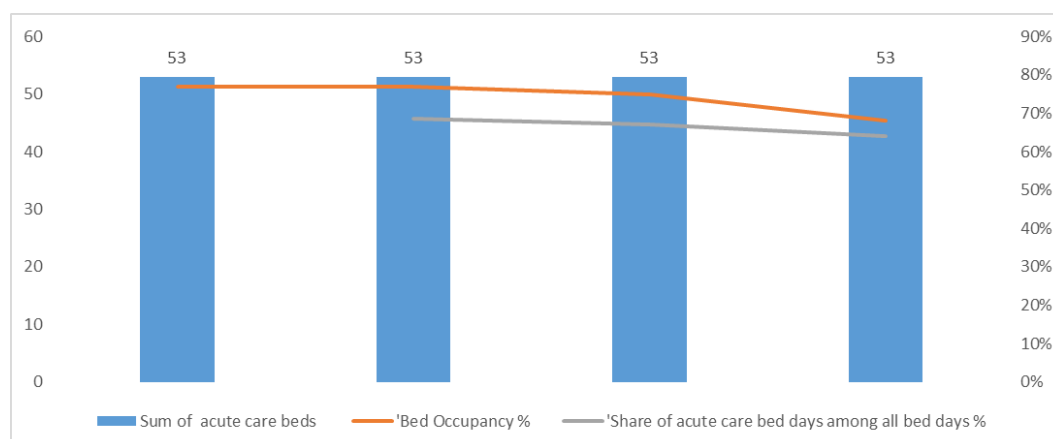
In 2019, there was 22 doctors FTE with age median of close to 60 years working in the hospital.

Figure 50 Läänemaa Hospital. Medical staff FTE-s



There were 53 acute care beds in Läänemaa Hospital in 2016-2018 with bed occupancy reduced from 77% to 68%. The hospital has 50 nursing care beds (bed occupancy 40% in 2018) and 36 social care beds.

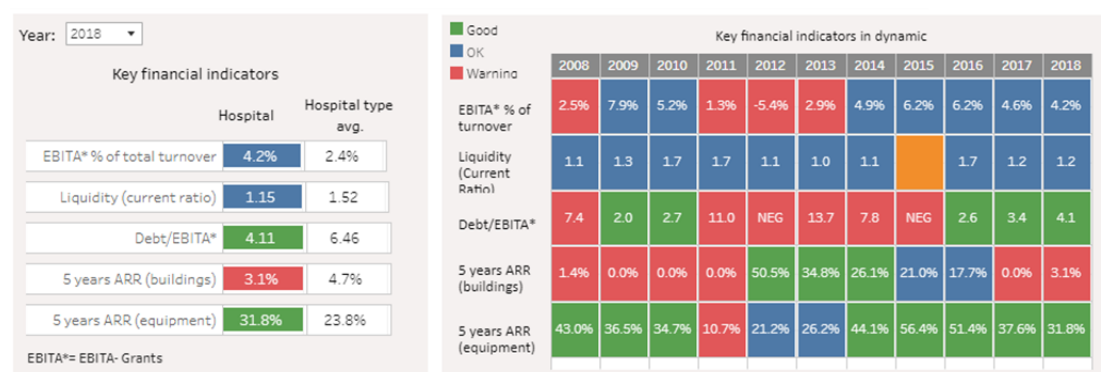
Figure 51 Läänemaa Hospital. Number of beds and bed occupancy 2015-2018



In 2012 Läänemaa Hospital renovated rooms for nursing care provision using support from EU structural funds and in 2017 Läänemaa Hospital applied for support from EU structural funds to create a health centre. Between 2015 -2018 the share of medical personnel costs in operating costs has increased from 49-53%, while the share of non-medical personnel cost has decreased from 17 to 13%.

Läänemaa Hospital have had mostly stable financial condition during the last 10 years except Debt/EBITA* ratio until consolidation with NEMC 2015.

Figure 52 Läänemaa Hospital financial sustainability evaluation

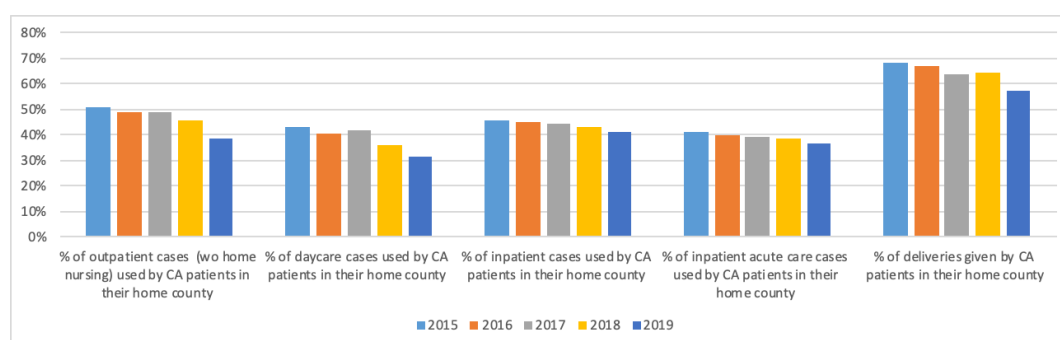


Põlva Hospital

Catchment area (CA) population of Põlva hospital is shrinking and is currently around 25 000 people. The county population has decreased 16% compared to 2004, while the 65 and older population has increased 10% reaching 6422 in 2019.

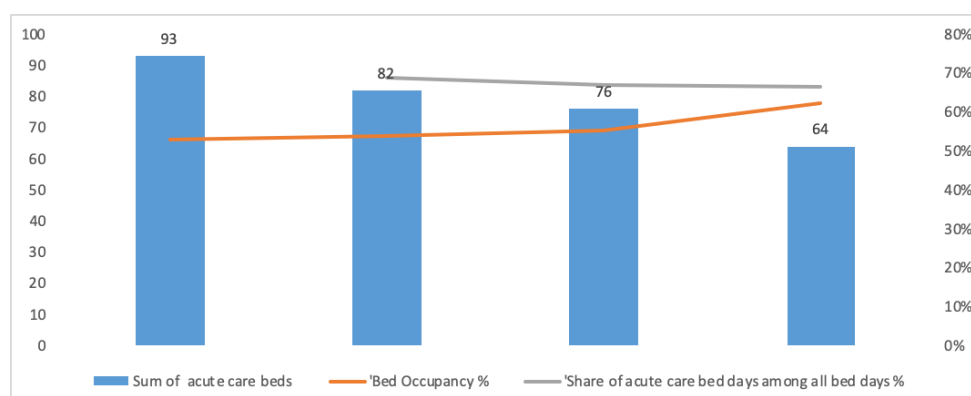
The average number of outpatient visits has dropped from 100 visits per day to 44 visits per day and increasingly more patients have moved outside county for outpatient visits 2015-2019. Also, the share of acute inpatients cases treated in their home county is decreasing from 41% in 2015 to 37% in 2019. There was less than a delivery (app 0,6) per day average during this period and the service was stopped from 2020. There were 3,4 surgical cases (0,8 in-patient) per working day, and less than 15 patients per day in average were treated in the ED in 2019.

Figure 53 Põlva Hospital. Share of services delivered for the population in their home county



In addition, the share of medical personnel cost in operating costs has increased significantly to 59%. At the same time, the structure of medical personnel has changed – the number of nurses has decreased by app 20% from 66 to 55 FTEs, while “other” medical personnel amount is increasing steadily. The total number of doctors has remained stable (around 30-35 FTEs) with 1,7 physical persons for one FTE in average. The hospital infrastructure usage operational efficiency has improved, and the bed occupancy rate has reached 62%, however, being still far from optimal (85%) level. The number of hospital beds has decreased from 93 to 64 between 2015-2018. The average area per bed was as big as 134 sq. m. in 2019.

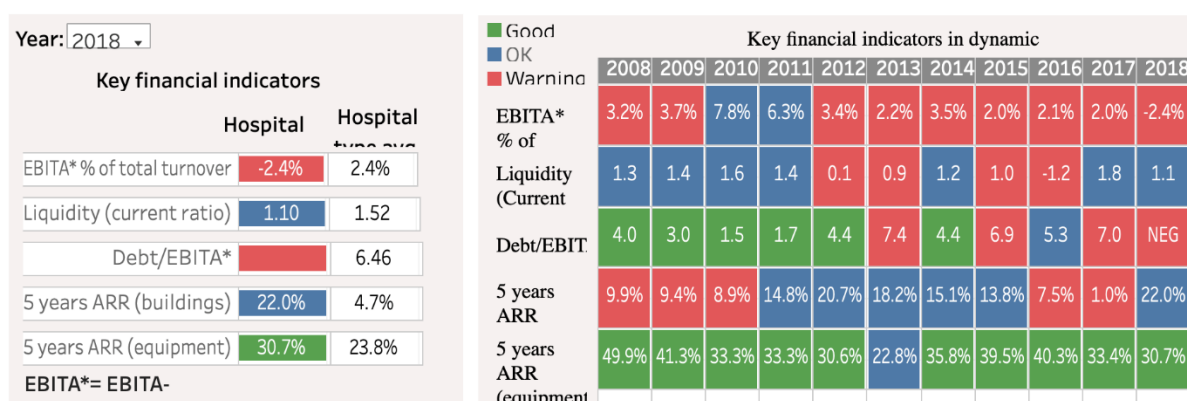
Figure 54 Põlva Hospital. Number of beds and bed occupancy 2015-2018



The hospital is located in a single mixed construction structure type building from 1985 with total floor area of 13 062 square meters. Despite of investments the average condition of the building's is judged as poor and due to mixed building construction type it is difficult to change functional floor plan.

During 2007-2009, Põlva Hospital received support from EU structural funds to renovate premises for nursing care provision and in 2017, to build health centre for better service integration with FD-s. Investments into different building projects have taken remarkable resources during last 10 years. EBITA* margin (% of turnover) and Debt/EBITA ratio does not enable any more larger investments despite of optimized running cost of premises.

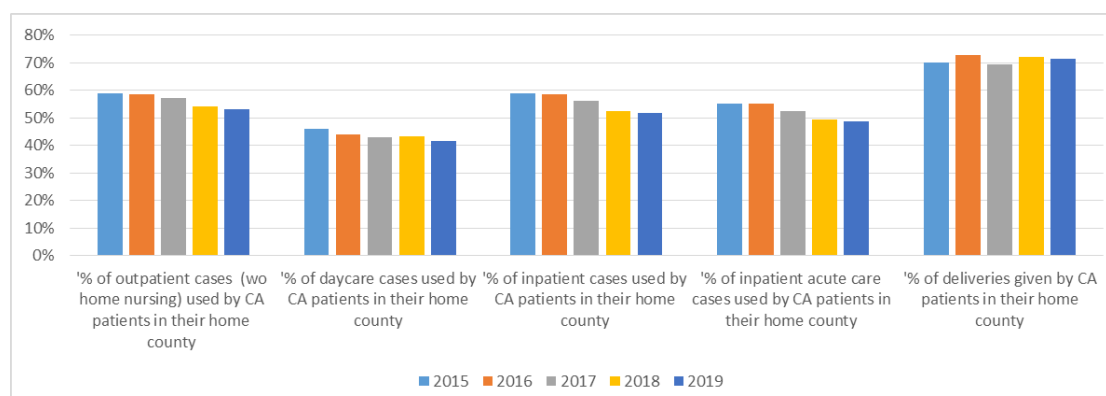
Figure 55 Põlva Hospital. Financial sustainability evaluation



South Estonia Hospital

Catchment area (CA) of South Estonia Hospital has decreased 14% since 2004 and comprises app. 30 thousand people as of today. During the same period, 65 and older population group has increased nearly by 1/3. Decreasing share but still approximately half of outpatient visits (53% in 2019) of Võru county habitants take place in the home county of patients. The share of day care cases and inpatient cases that took place in home county has also decreased gradually during 2015-2019.

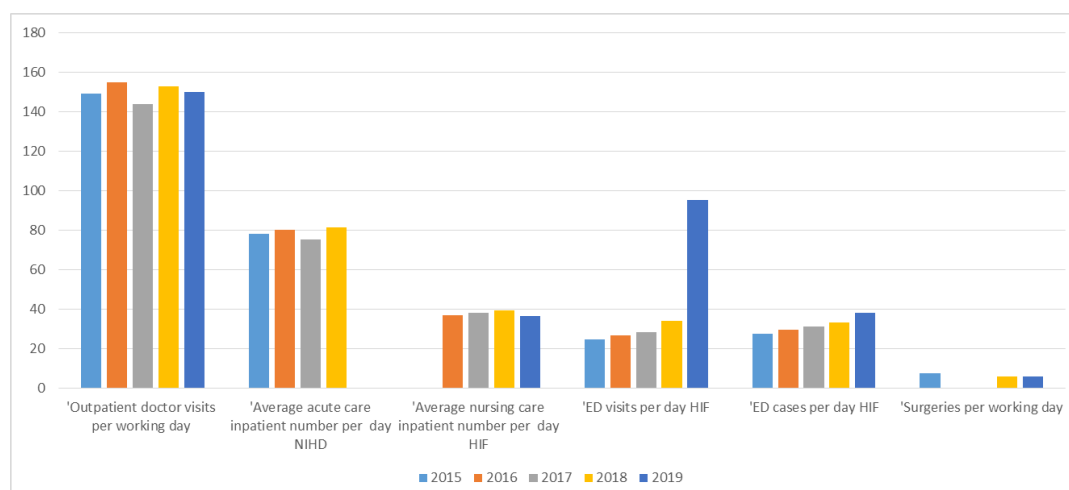
Figure 56 Võru County. Share of services delivered for the population in their home county



South-Estonian Hospital has been networked with and is located ca 80 km from TUH. In 2019 hospital on average did ca 6 surgeries per working day and 2/3 of the surgeries were day care surgeries. The hospital provides delivery services and the number of deliveries has increased from ca 230 to 330 in 2017-2019. The increase is obviously related to stopping the service in Valga and Põlva hospitals.

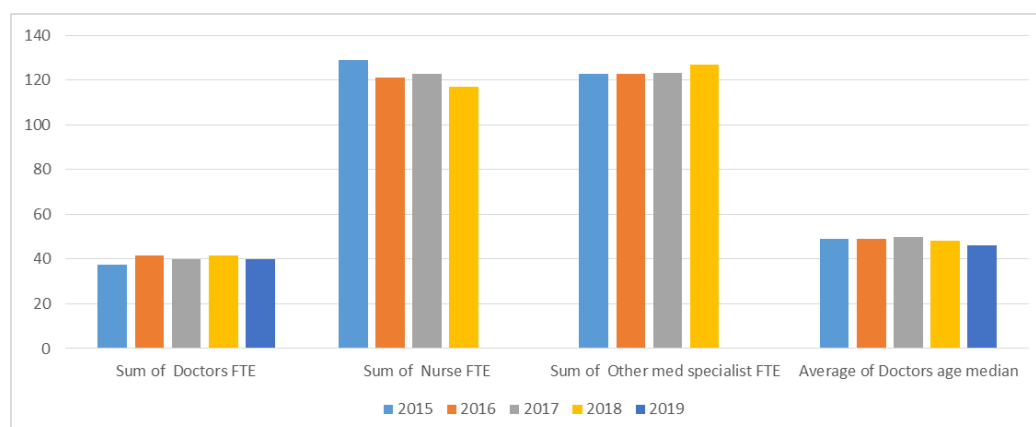
The number of ED cases per day has increased steadily to 38 patients in 2019, and in average there are ca 80 acute care inpatient and ca 40 nursing care patients in the hospital per day.

Figure 57 SEH. Average workload per day



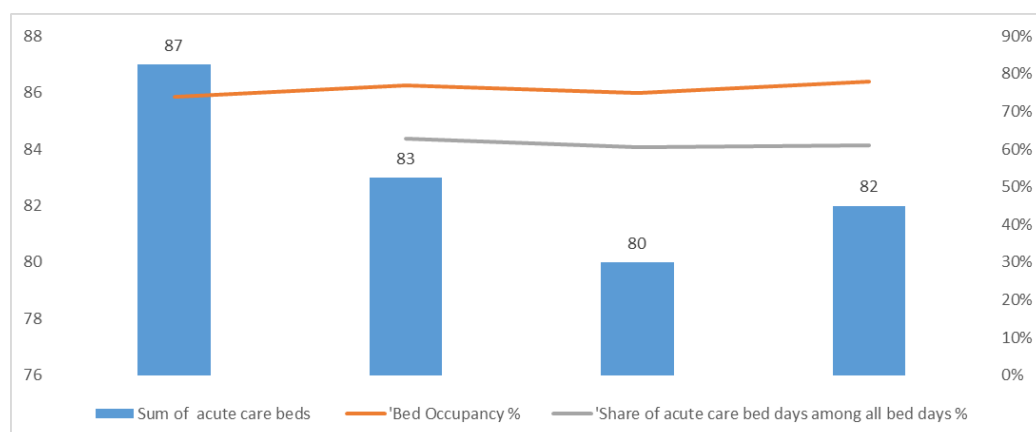
The hospital has 40 doctors FTE-s with age median of 46 years. However, there is 1,6 physical persons working per one FTE. This is indicating that a substantial part of doctors are actually working part time being full time employees at TUH or other hospitals. The number of nurses has decreased in 2015-2018 but the number of other medical specialists have had increasing trend.

Figure 58 Medical staff FTE-s in SEH



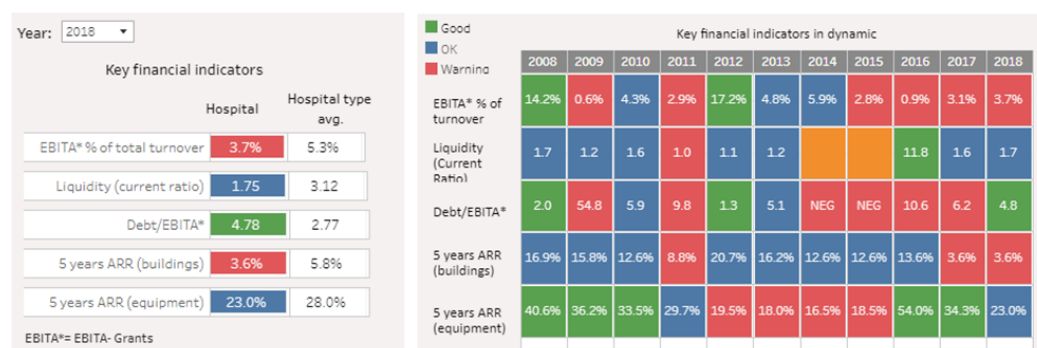
The number of acute care beds (82 beds in 2018) have rather stable with bed occupancy of 78%. South-Estonian Hospital has 46 nursing care beds (bed occupancy ca 88%) and 36 social care beds.

Figure 59 SEH. Number of beds and bed occupancy 2015-2018



The hospital is located in a 18339 sq. m. floor area 1982 erected building that was in 2008-2011 renovated rooms for nursing care provision using support from EU structural funds. In 2015 -2018 the share of medical personnel costs in operating costs has increased from 56-59%. Major concern related to economic sustainability of South-Estonian Hospital is with warningly low EBITA' margin and increasing costs of medical personnel (2015-2018).

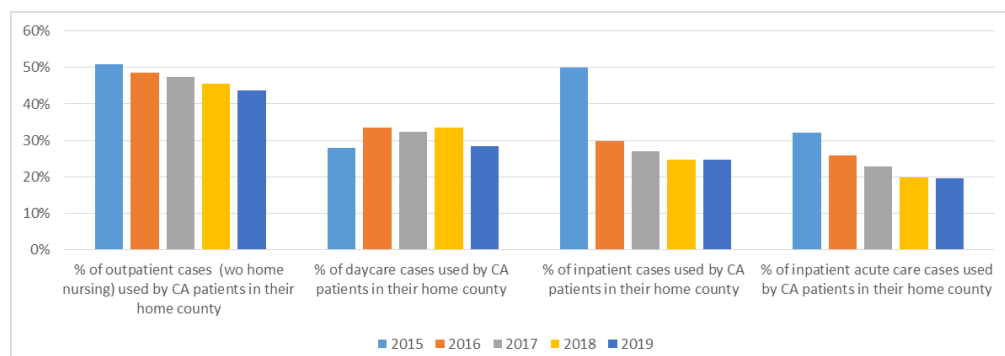
Figure 60 SEH. Financial sustainability evaluation



Rapla Hospital

Catchment area (CA) of Rapla Hospital is 34 thousand people. The total CA population has decreased by 9% while 65+ population has increased 26% since 2004. Less than a half of outpatient visits of the county residence take place in their home county.

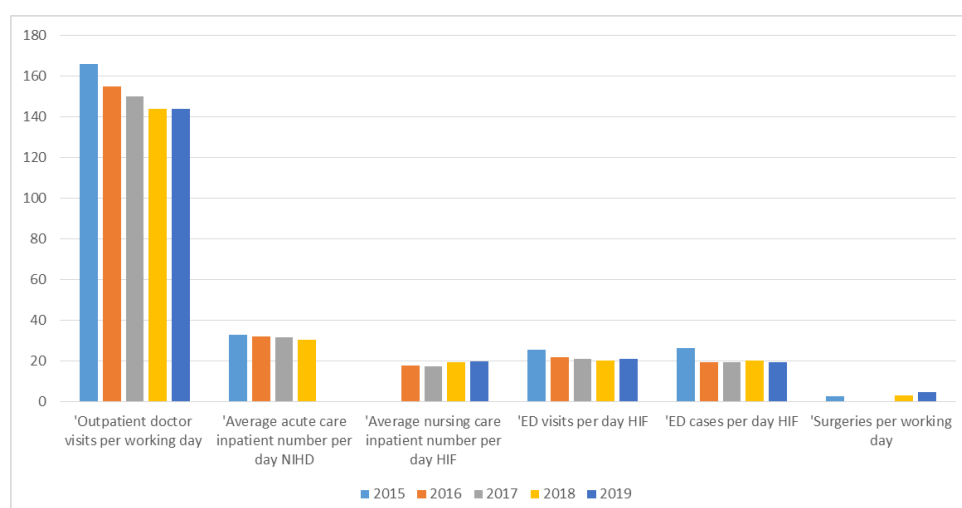
Figure 61 Rapla County. Share of services delivered for the population in their home country



Rapla Hospital is networked with North Estonia Health Centre. The hospital is providing outpatient and inpatient specialty care (including preliminary inpatient aftercare), day care, 24/7 emergency care, inpatient nursing care and home nursing. In 2019 hospital did on average ca 4 surgeries per working day, 3/4 of the surgeries were day care surgeries. Hospital does not provide delivery services.

There has been decrease in outpatient visits to 144 visits per day in 2019. There is app 20 ED cases per day, and ca 30 acute care inpatient patients (trend decreasing) and ca 20 nursing care patients (trend increasing) in the hospital per day.

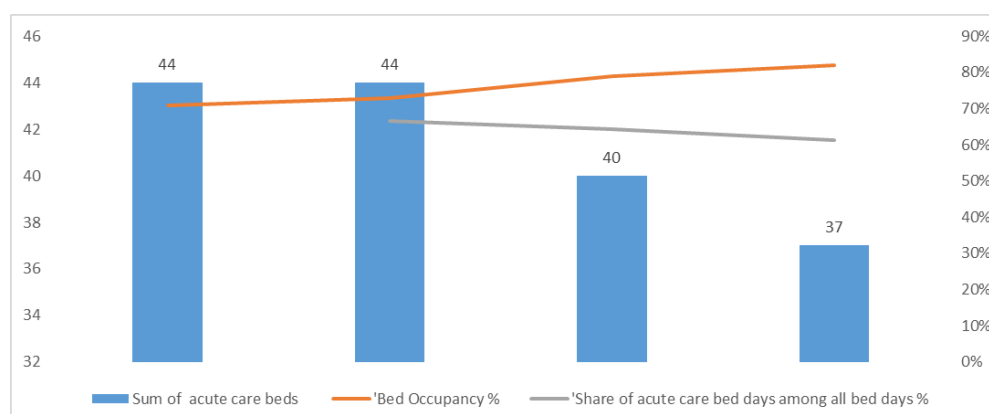
Figure 62 Rapla Hospital. Average workload per day



The hospital employs 24 doctors (FTEs) with median age of 51 years. Between 2015-2018, the number of nurses has decreased by 10%, same for other medical specialists by 35%.

The number of acute care beds has dropped to 37, while bed occupancy increased from 71% to 82% during 2015-2018. In addition, there are 25 nursing care beds (bed occupancy ca 80%) and 9 social care beds.

Figure 63 Rapla Hospital. Number of beds and bed occupancy 2015-2018

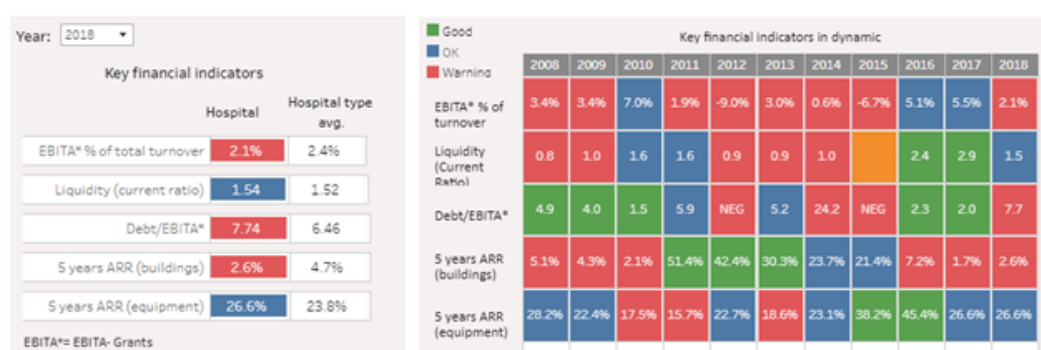


In 2012, Rapla Hospital renovated rooms for nursing care provision using support from EU structural funds and in 2017 applied for EU structural funds in order to build health centre for better service integration with FD-s.

In 2017 -2018, the share of medical personnel costs in operating costs has been 48-49%. Non-medical personnel cost has been 15-16% of operating costs. Cost of premises have decreased from 4 to 3% of operating costs in 2017-2018.

EBITA* margin (% of turnover) has been in warning zone for most of the years during 2008-2018. Before the investment related to nursing care, the hospital had a low loan burden. Networking with North Estonia Health Centre in 2015 helped to stabilize financial situation of the hospital.

Figure 64 Rapla Hospital. Financial sustainability evaluation



Jõgeva Hospital

Jõgeva county population is aging. The total population today is app 30 thousand and has decreased by 20% during the last 15 years while the number of 65+ age group has increased by 24%. Less than half of the outpatient cases for the population is delivered outside their home county with slightly decreasing trend.

Figure 65 Share of services delivered for the population in their home country

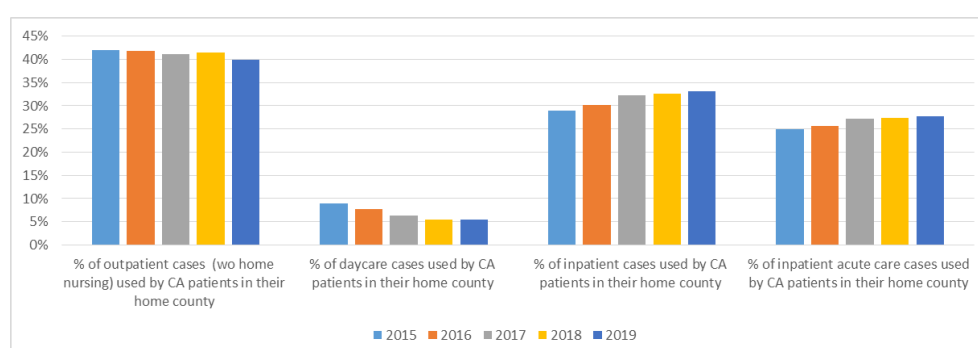
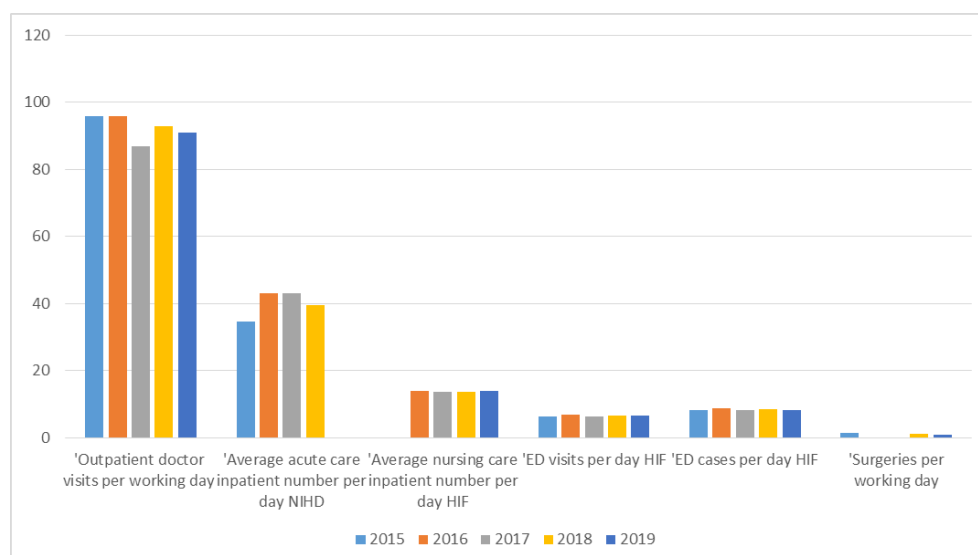


Figure 66 Average workload per day in Jõgeva Hospital



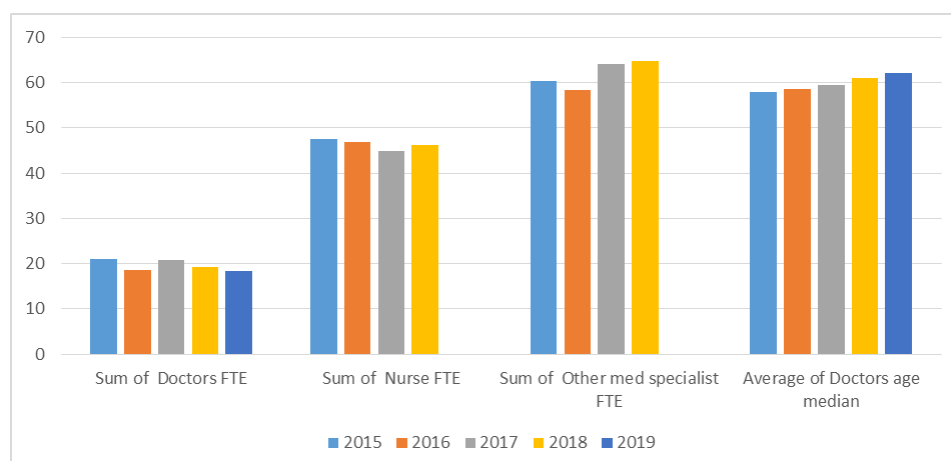
During the last years, positive financial results has been achieved thanks to restricted investments, decrease of medical personnel costs, improved collaboration with FD-s and increase in inpatient care revenue. Preparedness fee does not play significant role in the hospital revenues. The bed occupancy for 70 bed in use in the hospital is low (57% in 2018), but since room standard of wards is not high, the cost of premises has remained under control. The area per bed is rather big (118 sq.m.)

Figure 67 Jõgeva Hospital. Number of beds and bed occupancy 2015-2018



Due to high median age of doctors (62 years in 2019) the hospital can face problems with filling clinical positions in the not so far future. During 2015 -2018, the cost of medical personnel salary has increased ca 5-6% annually but the share of medical personnel costs in operating costs has decreased from 62-58%.

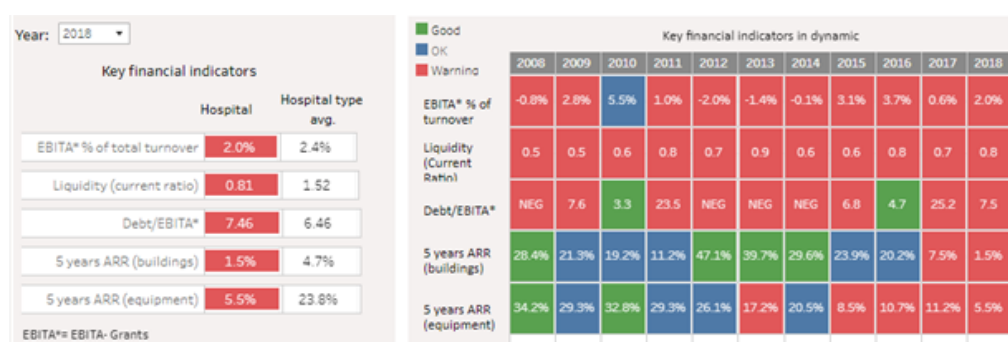
Figure 68 Medical staff FTE-s in Jõgeva Hospital



The hospital collaborates closely with FD-s and several FD-s are renting premises from the hospital. ED cases number per day is low (8,35 cases per day, that is 2-3 times lower than in other small hospitals). Despite of fast increase in 65+ age patients, the number inpatient nursing bed days and home nursing visits per 65+ habitant is decreasing. Share of acute care bed days in Jõgeva Hospital is ca 75% of all patient bed days. Most of inpatient nursing care in the county is provided by other HC providers. The hospital does not provide any surgical profile services, incl. deliveries. Thus, compared to other small hospitals Jõgeva Hospital has preparedness fee just 7% of inpatient EHIF contract compared to 14% in other small hospitals.

Due to sub-optimal liquidity and week debt serving capability the hospital has difficulties to acquire necessary financial resources for investments (like co-payment for EU support projects). 5-year reinvestment of equipment is rather limited.

Figure 69 Jõgeva Hospital. Financial sustainability evaluation

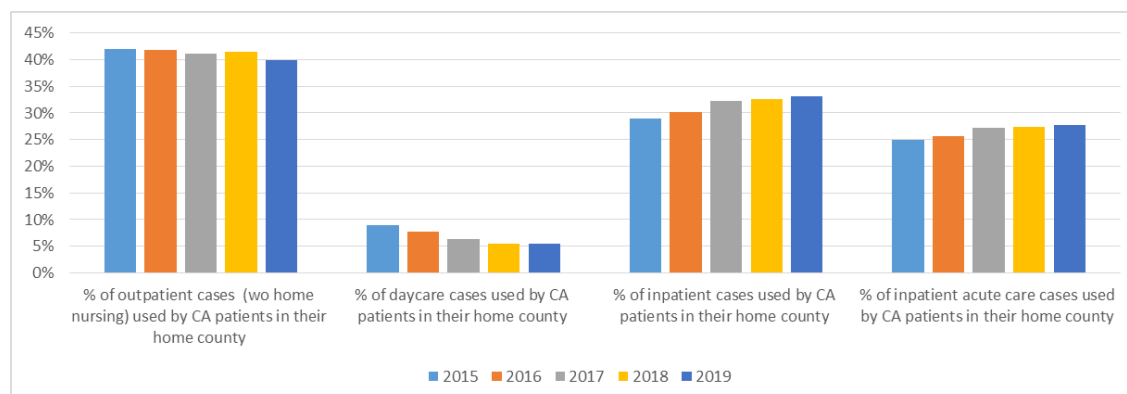


Valga Hospital

Catchment area (CA) of Valga Hospital is ca 30 thousand people. The population has decreased 15% compared to 2004.

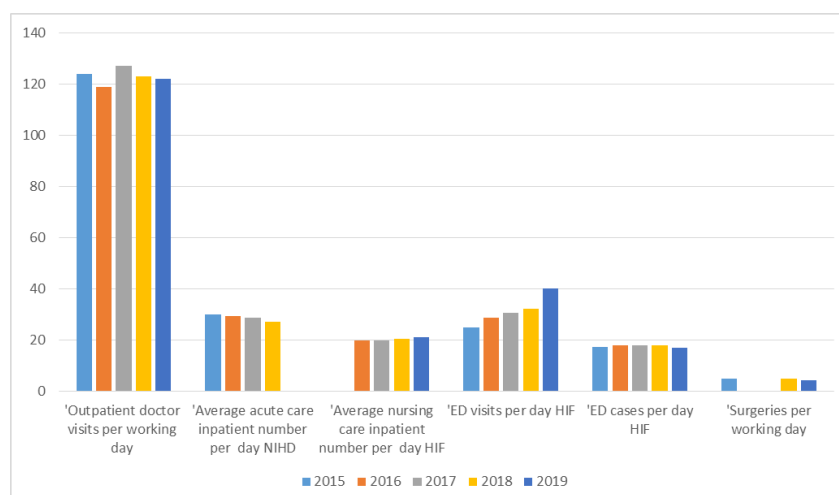
Valga County is one of counties with habitants getting of health care services in the home county, however, with an increasing trend inpatient care after consolidation with Tartu University Hospital in 2016. At the same time the average number of outpatient visits per day to doctors has declined from 89 to 66 in 2015–2019.

Figure 70 Valga County. Share of services delivered for the population in their home country



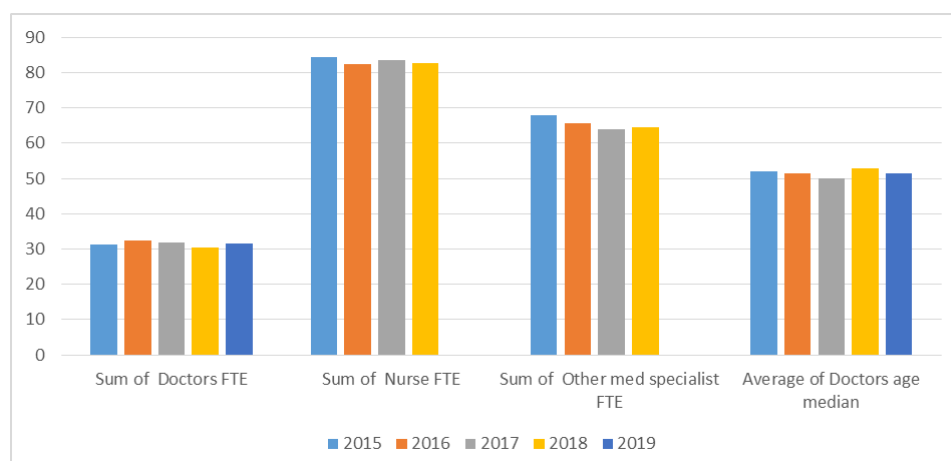
Valga Hospital is located ca 85 km from Tartu University Hospital. Hospital finished provision of delivery services in 2018 due to small number of deliveries (less than 150 annually). In 2019 the hospital did on average ca 4 surgeries per working day, (75% day surgeries) and received 17 ED patients per day. On average there are ca 30 acute care inpatient and ca 20 nursing care patients in the hospital per day.

Figure 71 Average workload per day in Valga Hospital



32 doctors (FTE-s) have age median of 50 years and the number has been stable in the last 5 years, while the number of other medical specialists has somewhat decreased.

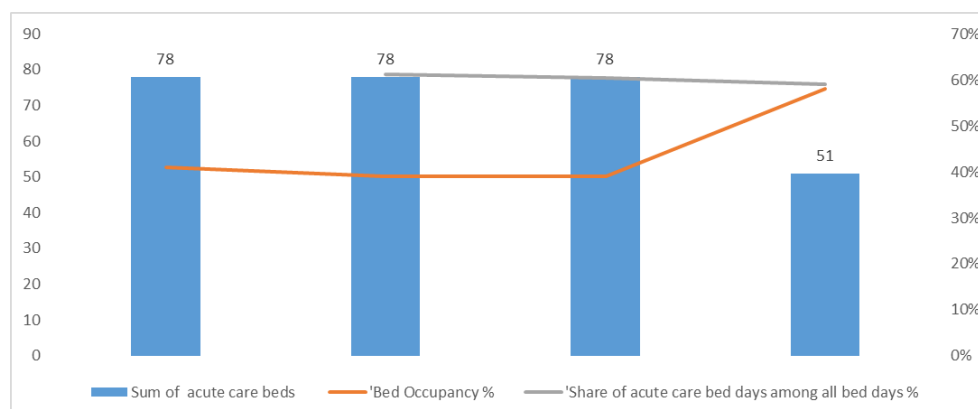
Figure 72 Medical staff FTE-s in Valga Hospital



The number of acute care beds has dropped dramatically from 78 to 51 and bed occupancy improved from 41 to 58% after consolidation with TUH. 30 nursing care beds had bed occupancy of 84% in 2018.

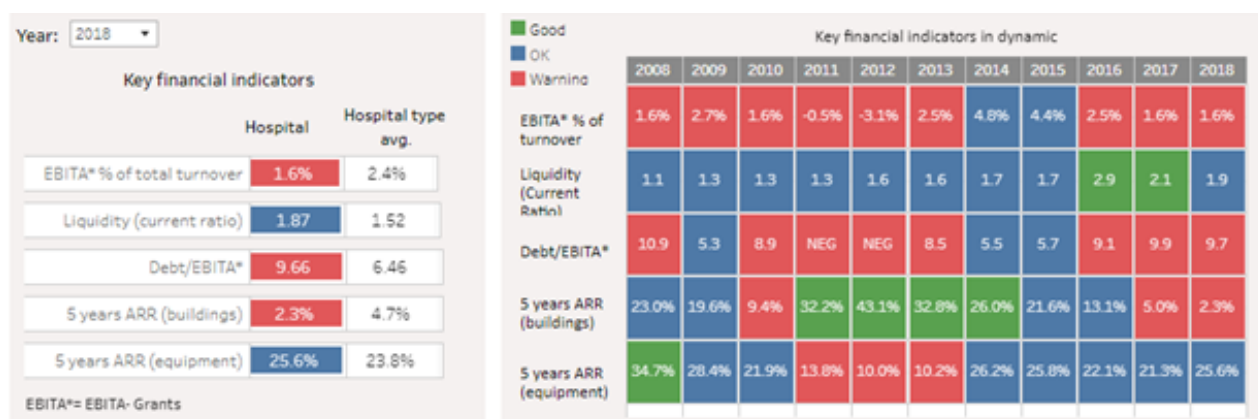
Valga Hospital has been fully renovated in 2000 and has received investment support by EU funds in several occasions afterwards.

Figure 73 Valga Hospital. Number of beds and bed occupancy 2015-2018



During 2014 -2018 the cost of medical personnel salary has increased ca 1-2% annually but the share of medical personnel costs in overall operating costs has decreased from 54-50%. The share of non-medical personnel costs in operating costs is 17%. Reinvestment rate into the medical devices and buildings has been at sufficient level, while Debt/EBITA* is warningly high since 2016.

Figure 74 Valga Hospital. Financial sustainability evaluation



5. List of Annexes

Annex No	Content	Format
1	Mapping of medical workforce in hospitals	Tableau
2	Staff satisfaction survey and working environment	PDF
3	Patient's feedback on hospital treatment and person-centredness of the care	PDF
4	Mapping of hospital infrastructure and usage	Tableau
5	Infra and equipment for analysis	Excel
6	Economic sustainability analysis	PDF
7	Economic sustainability analysis dynamic data viewer	Tableau
8	Analysis of financial incentives that influence service provision of HNDR hospitals	PDF
9	Home hospital service on the example of Viljandi Hospital	PDF
10	IT Maturity Model results	PDF
11	Avoidable hospitalization Guidelines 2019	PDF
11	Avoidable hospitalisations	Excel