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ESTIMATING RESOURCES ASSOCIATED WITH DELIVERING TELEMEDICINE SERVICES AT FACILITY LEVEL IN UKRAINE

January 2024

Local Health System Sustainability Project

The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ helps low- and middle-income countries transition to sustainable, resilient health systems as a means to support universal health coverage. The project works with partner countries and local stakeholders to reduce financial barriers to care and treatment, ensure equitable access to essential health services for all people, and improve the quality of health services. Led by Abt Global, the five-year, $209 million project will build local capacity to sustain strong health system performance, supporting countries on their journey to self-reliance and prosperity.

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ABBREVIATIONS

Term	Definition
CDB	Central database
ECG	Electrocardiogram
EDRPOU	The Unified State Register of Enterprises and Organizations of Ukraine
eHealth	eHealth Electronic Health Record System
EHR	Electronic health record
FTE	Full-time equivalent
IDP	Internally displaced person
FOP	Fizychna osoba-pidpryemets: type of legal entity – individual entrepreneur or small or medium-sized enterprise
LLC	Limited liability company
MIS	Medical information system
MOH	Ministry of Health of Ukraine
NHSU	National Health Service of Ukraine
PHC	Primary healthcare
PHC center	Primary healthcare center
PMG	Program of Medical Guarantees
PP	Private provider
RTC	Regional telemedicine center *(this abbreviation is used in tables)*
US	Ultrasound imaging

GLOSSARY

1-HC report is an income statement, a managerial analytical financial report of NHSU on the provision and use of resources at the level of a communal non-profit enterprise.

Capital investments are capital construction, purchasing, or manufacture of fixed assets and intangible assets, their modernization for the purpose of economic gain in the future, improvement of the delivery of health services, and creating decent working conditions.

A **cost item** is a set of costs related to business activities or service provision and grouped based on their homogeneity (for example, labor costs, depreciation of medical devices, staff training).

Groups of nomenclature items are specific names of inventory items, works and services, fixed assets, intangible assets, and other. grouped by homogeneity (e. g., ECG and US with data transmission function, mobile diagnostic telemetry systems).

A **health service package** (PMG package) is a list of health services and medicines for their delivery within a certain type of healthcare, for which unified specifications, purchasing conditions, tariff type, and basic rate are established. The delivery of these services is covered by NHSU under relevant contracts.

Introduction of telemedicine services means making capital investments in the assets of a health facility, i.e., hardware, software, capital construction or remodeling, inventory, other tangible and intangible assets, as well as special training for personnel and patients. In the study, these costs of health facilities are presented in the Data Collection Form 1 *Introduction*.

Inventory means materials, components, low-value and rapidly wearing items, and other material assets purchased or received in kind. Capitalized inventory means reserves, i.e., part of the resources that ensure the continuity of healthcare provision.

Personnel involved in telemedicine are employees of different categories and specialties whose functions are related to the delivery of health/rehabilitation services by means and methods of telemedicine in different scope and areas.

The **Program of Medical Guarantees (PMG)** is a program that defines the list and scope of health services, medical devices, and medicines, which are guaranteed by the state and fully covered by the state budget of Ukraine.

Resource provision is the receipt by a health facility of funds and resources in kind, namely inventory and capital investments (e.g., telemedicine equipment, devices, software).

Resource use, or costs, is the costs incurred by a facility to acquire assets (such as inventories and capital investments), as well as current expenses in the accounting period (e.g., labor costs, payment for the work performed or services rendered) excluding depreciation of non-current assets and excluding the inventory used. Such costs are the resources used in monetary terms.

Teleconsultation (telemedicine consultation) is an electronic health record in the system about an *interaction* described as “patient consultation conducted by means of telecommunication.”

Telemedicine delivery costs are the costs incurred at the facility level to provide telemedicine services, namely salaries of the personnel involved in telemedicine, training of the personnel and patients, technical support, maintenance, and servicing of hardware and software, rental of medical equipment and premises for telemedicine. These costs are incurred when medical devices and other inventories are used. They include liabilities for services (teleconsultations, utilities, communication), depreciation of equipment. In the study, a complete list of costs broken down by items and groups of nomenclature items is provided in the Data Collection Form 2 *Delivery*.

Telemedicine services are health/rehabilitation services provided by means and methods of telemedicine.

INTRODUCTION

In 2017, the Law of Ukraine *On State Financial Guarantees of Healthcare for the Population* was adopted. The Law determines financial obligations of the state regarding health services and medicines for patients. In accordance with the Law, the National Health Service of Ukraine (NHSU) was established in late 2017 as a national strategic purchaser performing the function of a customer for medical services, medicines, and medical devices under the Medical Guarantee Program (PMG), and the first such program was developed in 2020.

Given the problems with healthcare access for the rural population, on November 14, 2017, the Law of Ukraine *On Improvement of the Accessibility and Quality of Healthcare Services in Rural Areas* was adopted, which provided, in addition to the development of a network of health facilities and transport infrastructure in rural areas, for the widespread introduction of telemedicine services as one of the main spheres of rural healthcare development.

Due to the upheavals in recent years (such as those caused by the COVID-19 pandemic and the full-scale invasion of Ukraine by the Russian Federation in 2022 that led to health infrastructure destruction and massive population displacements), the possibility of direct access to health services has significantly decreased. As a result, the demand for telemedicine services began to grow rapidly.

In 2023, the *Strategy for Telemedicine Development in Ukraine* was approved and an integrated approach to the use of telemedicine was envisaged by law. This created regulatory preconditions for the systemic development of telemedicine in the near future.

The Ministry of Health of Ukraine (MOH) approached the Local Health System Sustainability Project (LHSS) with a request to assist in analyzing the financial component of telemedicine services. The NHSU, for its part, confirmed that it is interested in this information and needs it, so LHSS received full support and assistance in implementing the study, which lasted from July 2023 to January 2024.

The LHSS Project is implemented by Abt Global in more than 20 countries with the support of the United States Agency for International Development (USAID). In Ukraine, LHSS supports the Government of Ukraine in laying the groundwork for institutional arrangements and building capacity to manage and ensure the sustainable and secure delivery of telemedicine services to the population. LHSS also supports the rapid and efficient build-up of telemedicine capacity in the context of the Russian invasion and assists the Government of Ukraine in implementing telemedicine solutions in the healthcare system. One of the tasks of the LHSS project is to support analytical work and develop recommendations and approaches for the MOH and the NHSU in the purchasing of health services provided with the use of telemedicine.

1. RATIONALE

Telemedicine is an important component of health services under the Program of Medical Guarantees (PMG). Thus, according to the Landscape Assessment of Telemedicine in Ukraine conducted by LHSS,[1] out of a total of 41 packages of health services covered by PMG in early 2023, 11 packages provided for the use of telemedicine in various forms. However, the regulations do not always use standard telemedicine terms, which often leads to misunderstandings on the part of physicians.

It was also found that patients and most physicians do not know that telemedicine services[2] are provided under PMG and covered by tariffs in the same way as other services.

Another important observation of the Landscape Assessment is that healthcare providers often mistakenly believe that telemedicine services should be provided using special equipment, and regular cell phones are insufficient for that purpose (according to our study, a similar opinion is shared by physicians), although this is the simplest telemedicine service. Therefore, according to their expectations, telemedicine services should be paid for as a separate service or as a separate "telemedicine" package.

All of this confirms the relevance of estimating the resources used for telemedicine development and delivery.

The main objective of the study was to understand the current use of telemedicine and the costs of its delivery, especially the cost drivers, to inform further improvements in PMG purchasing arrangements.

[1] The Local Health System Sustainability Project (LHSS) within the USAID Integrated Health Systems IDIQ Project. March 2023. *Landscape Assessment of Telemedicine in Ukraine* Rockville, MD: Abt Associates. URL: https://www.lhssproject.org/sites/default/files/resource/2023-05/LHSS_UKRAINE_FY23_Landscape%20Assessment%20of%20Telemedicine%20in%20Ukraine_Ukr.pdf.

[2] Hereinafter, the term "telemedicine services" is used to refer to health/rehabilitation services provided by means and methods of telemedicine.

2. STUDY DESIGN

The study was designed together with NHSU to generate knowledge on telemedicine provision under PMG and inform further improvements in PMG purchasing. The specific objectives of the study included:

- Understand what methods of telemedicine and what type of services are currently delivered via telemedicine and how they are recorded in eHealth.
- Estimate the resources used to introduce (investments) and deliver (operating and service costs) telemedicine at the facility level.
- Define the cost categories and items associated with telemedicine at the facility level.
- Understand the cost drivers associated with telemedicine at the facility level.
- Understand categories and LOE of personnel involved in telemedicine.[3]
- Identify interesting/noteworthy practices of the organization of telemedicine services delivery.

The methodology considered the country context (current status of eHealth data and the PMG purchasing system) and international experience. The methods used were:

- Desk-based review
- Descriptive analysis of eHealth data on telemedicine provision by all health providers in 2021–2022
- Purposefully selected sample for cost analysis
- Cost analysis (retrospective data for 2021–2022): actual spending, cost categories
- A checklist of cost categories related to investment, operational and service costs for telemedicine was adopted from the Cost Analysis of Telemedicine Implementation in the Lens of Healthcare Sustainability: A Review of the Literature | SpringerLink (Table 2.1)
- Analysis of personnel involved in telemedicine, including in full-time equivalent (FTE)
- Key informant interviews with facilities.

Table 2.1: A checklist of telemedicine cost items. Source: Cost Analysis of Telemedicine Implementation in the Lens of Healthcare Sustainability: A Review of the Literature

Introduction	Delivery
Investment costs	Operating and service costs
Hardware:	**Personnel:**
• Medical devices	• Physicians
• Office devices:	• Nurses
▪ PC	• Technical
▪ Printer	• IT
▪ Office furniture	• Call center / Telemedicine center
▪ Other	• Administrative

[3] Hereinafter, the term "personnel involved in telemedicine" is used to refer to employees of different categories and specialties whose functions are related to the delivery of health/rehabilitation services by means and methods of telemedicine in different scope and areas.

Introduction	Delivery
Investment costs	Operating and service costs
Software:	**Staff Education:**
• License	• Continuous training
	• Upgrade training
IT infrastructure:	**Service Hardware:**
• Server	• Depreciation of medical devices
• Internet	• Rental of medical devices
• Utility lines	
• Privacy security	
Call Center Equipment:	**Organization Hardware:**
• Office devices:	• Depreciation:
▪ PC	▪ Office devices
▪ Printer	▪ IT infrastructure
▪ Office furniture	▪ Call center equipment
	▪ Space
Construction and Remodeling of Office Space:	**Software:**
• Office restorations	• Depreciation:
• New building constructions	▪ License
Setup Costs:	**Patient Support:**
• Business processes	• Enrollment
• Privacy security	• Training
	• Consulting
Personnel:	**Direct Material:**
• Temporary hiring	• Medical consumables
• Training (basic skills, new work processes)	• Office consumables
Privacy Security	**Utilities:**
	• Electricity
	• Gas
	• Communication costs
	• Water
	Waste Disposal

For cost analysis, the team took into account the following considerations.

Table 2.2: Considerations for cost analysis

	Explanation
Services defined as telemedicine for analysis	• Services provided under PMG by NHSU-contracted health facilities with the use of telemedicine tools and methods recorded in eHealth: ▪ telemedicine methods: teleconsultation, telemetry, teleradiology ▪ types of services: doctor-to-patient, doctor-to-doctor
Criteria for selection providers for cost analysis	• Health providers contracted by NHSU for PMG in 2021-22 which: ▪ actively provided telemedicine services based on eHealth data ▪ represented different types of providers (public communal, FOPs and private) and different regions ▪ known as a “good practice” based on expert opinion • Facilities that voluntarily consented to participate in the study

	Explanation
Cost analysis	• Actual resources (financial, non-financial, human) used to introduce and deliver telemedicine services (Retrospective data 2021–2022). • Investment and delivery costs by categories according to the checklist of telemedicine cost items (Table 2.1) and cost drivers. • Analysis of the personnel involved in telemedicine (categories and FTE): facility data, FTE-based estimates. (FTE methodology is presented in the section below). • Mix top-down and bottom-up allocation methods
Data sources	• Secondary data: eHealth data for 2021 and 2022; 1-HC reports for 2021 and 2022 • Additional data collected at facility level

Methodology for personnel analysis in FTE. The number of personnel in FTE shows the estimated number of employees working full time required to perform the scope of work and services established (determined) by the facility. To determine this number, the paid working time[4] of all the employees who performed work during the specified time and received salary is converted into the estimated number of employees that would be sufficient to perform the actual amount of work if all such employees worked full time.

The average number of personnel was calculated by the facilities in accordance with the *Instruction on the Statistics of Personnel Number* approved by the Order of the State Statistics Committee of Ukraine No. 286[5] of September 28, 2005, and the personnel number in FTE was determined according to the algorithm provided in the example of calculating the personnel number in FTE of the Instruction.

The number of personnel involved in telemedicine in FTE is calculated as the ratio of total working hours of all the employees to average working hours per employee per year.

The number of personnel in FTE that would be required to perform only telemedicine-related functions is calculated as the ratio of the total amount of time during which telemedicine-related services were provided or relevant functions were performed to the average working hours of one employee.

The percentage of time used by personnel to perform only telemedicine-related functions is calculated as the ratio of the estimated number of personnel in FTE that would be required to perform only telemedicine-related functions to the number of personnel involved in telemedicine in FTE.

Determining the list of required data and developing data collection forms. The main source of data for the analysis of telemedicine provision was Electronic Health Records (EHR) in eHealth. The data request included the 2021–2022 dataset on service provision by any telemedicine methods by all NHSU contracted health providers disaggregated by type of providers, regions, PMG packages, medical specialties, and gender/age of patients.

For cost analysis, the data collection form was designed (programmed Excel sheets) based on information available in the NHSU 1-HC (financial) report and it also included additional data on personnel. The checklist of cost categories (Table 2.1) was adopted

[4] Working time is worked and non-worked time during the year for which salary was accrued.

[5] Order of the State Statistics Committee of Ukraine No. 286 of September 28, 2005, *On Approval of the Instruction on the Statistics of Personnel Number*. URL: https://zakon.rada.gov.ua/laws/show/z1442-05#Text.

and linked with the 1-HC report fields. The final data collection form at the facility level included:

- Detailed instructions for data collection
- Data on telemedicine services
- Data on resources used for telemedicine by cost items and sources of funds (PMG, facility owners, other public funds, charitable funds, and other sources)
- Data on personnel involved in telemedicine provision at facility
- Total volume and revenue of telemedicine services provided to other health facilities under contracts (if any).

To calculate the number of personnel in FTE, the following data were collected from the facilities:

- Total number of man-hours for which salary was accrued for each category of personnel per year (source: accounting data)
- tTotal amount of time (man-hours) for the year during which telemedicine-related services were provided or relevant functions were performed (source: estimated data provided by the facilities, which required them to determine the relevant functions of the personnel and the time required to perform them)
- Average working hours per employee for each category of employees per year. This indicator is different for different categories of employees (source: HR records).

The following rules were agreed upon for data collection:

- Providers define staff categories and number and LOE of employees involved in telemedicine (best estimates/ self-assessment).
- All assets, such as MIS, computers, furniture, which are related and used not only in telemedicine, are attributed to telemedicine based on the number and LOE of personnel involved in telemedicine. For example, a desk and computer are considered telemedicine-related costs if they belong to an employee who is involved in telemedicine provision.
- Data submitted by facilities are to be verified by comparing with the NHSU 1-HC reports.

2.1. Study limitations

During the study, the team faced the following limitations:

- At the time of the study, the team lacked reliable demographic data that would reflect significant changes in the population structure due to migration caused by the full-scale invasion of the Russian Federation. In view of this, it was decided not to account for the geographical distribution of the population when sampling the data.
- In the first half of 2022, health facilities were legally authorized[6] not to enter data into the eHealth system, resulting in the loss of some information for this period. In

[6] Resolution of the Cabinet of Ministers of Ukraine No. 529 of May 03, 2022, *On Amendments to the Resolutions of the Cabinet of Ministers of Ukraine No. 410 of April 25, 2018, and No. 1440 of December 29, 2021*. URL: https://zakon.rada.gov.ua/laws/show/529-2022-п#Text.

addition, facilities located in or around active hostilities or temporary occupation are currently not (or incompletely) entering data.

- Data on telemetry, teleradiology, and doctor-to-doctor consultations are not recorded in eHealth. eHealth only contains data on doctor-to-patient consultations conducted using telecommunication. Therefore, the study analyzed primarily doctor-to-patient consultations.
- The work of the facilities within the study was voluntary and required a significant time investment by the personnel. Therefore, some of the facilities that were initially included in the study later refused to participate.
- Private facilities (unlike, for example, public communal providers) are not legally required to submit information on their financial performance, including 1-HC reports, to the NHSU. This made it impossible to estimate the share of resources used for telemedicine or analyze the share of personnel involved in telemedicine in these facilities.

2.2. Selection of health facilities

The criteria for provider selection for costing analysis were developed together with NHSU (Table 2.2) and included several steps:

1. The team analyzed eHealth data structure to define telemedicine-related data. The analysis confirmed that the only telemedicine-related data recorded in eHealth was EHR data on consultation provided by "means of telecommunication," and this type of consultation was considered "doctor-to-patient teleconsultation" for this study. Based on data analysis on teleconsultation provided in 2021–2022, the team formed a preliminary list of 57 facilities that (1) have a high number of teleconsultations, (2) deliver various types of health services under PMG, and (3) represent a different type of facilities (and legal status) and wide geographical coverage.

2. Although doctor-to-doctor consultations were not registered in the Central Database (CDB) of eHealth, the team included one regional clinical hospital with a telemedicine center (hereinafter referred to as the regional telemedicine center), which was created specifically to provide telemedicine services by physicians of the regional hospital to physicians of other hospitals or PHC (doctor-to-doctor teleconsultations).

3. The initial list of 57 facilities was discussed and verified with NHSU to confirm the status of contractual relationships (b/t NHSU and facility) and collect feedback on the experience and quality of cooperation with the selected facilities. As a result, 45 out of 57 facilities were validated by NHSU for the next stage.

4. The final list was formed based on providers' consent to participate in the study and share data. Thus, the final sample included 30 health facilities that belong to different types of providers and offer different types of care (Table 2.3).

In this report, health facilities are anonymized for confidentiality by replacing their EDRPOU codes with a description of the type of facility/type of care. For example, line 1.2 of Table 2.3 indicates that four participating facilities are hospitals and polyclinics providing primary healthcare and other outpatient packages. So, later in the report, they are designated as "PHC and other outpatient packages 1," "PHC and other outpatient

packages 2," "PHC and other outpatient packages 3,"and "PHC and other outpatient packages 4."

Table 2.3: Selected health facilities by legal status, type of care and type of facility

No.	Provider by legal status and type of care	Type of facility	No. of facilities
1.	**Public Communal Providers**		**23**
1.1.	Outpatient package, mobile palliative care, management of pregnancy, other	Multidisciplinary hospitals	3
1.2.	PHC and other outpatient packages	Hospitals, polyclinics	4
1.3.	Tuberculosis	Regional tuberculosis dispensary	1
1.4.	PHC and mobile palliative care	Primary healthcare center	4
1.5.	HIV	Specialized centers, polyclinic	3
1.6.	Mobile palliative care	Children's and district hospitals, rehabilitation center for combatants, polyclinic association	4
1.7.	Management of pregnancy, gynecology	Maternity hospital	1
1.8.	PHC	Primary healthcare center and polyclinic	2
1.9.	Psychiatric and palliative care	Regional institution for psychiatric care	1
2.	**Public Communal Provider**	**Regional telemedicine center (RTC)**	**1**
2.1.	The regional telemedicine center provides doctor-to-doctor teleconsultations to physicians in the region	Telemedicine center of the regional multidisciplinary hospital	1
3.	**Private Providers**		**6**
3.1.	PHC and mobile palliative care	Limited liability company	3
3.2.	Mobile palliative care (LLC, PE)	Limited liability company, private enterprise	3
	Total		**30**

Table 2.4: Facilities by the type of provider and telemedicine method, 2021–2022

Type of provider/ telemedicine method	2021	2022
1. Public communal providers, total	21	24
Among them, by the telemedicine method:		
1.1. Doctor-to-patient	20	23
1.2. Doctor-to-doctor	1	1
2. Private (excluding FOPs), doctor-to-patient interaction	2	6
Total	**23**	**30**

3. PROCESS

The study design, data collection, review, and analysis were conducted between August and December 2023, and study results were finalized, presented and published (original Ukrainian version) between January and March 2024.

Organization of work with NHSU and facilities. To facilitate the study, NHSU assigned three coordinators from the Department of Universal Health Coverage Strategy. NHSU also provided data EHRs of the facilities for 2021 and 2022. NHSU coordinators actively contributed to the design and management of the study.

As mentioned in the section above, the data requirements and data sources were defined, and a data collection form was developed and used by all facilities selected for cost analysis. The data collected by each facility was further consolidated into an analytical module (Microsoft Power BI).

Facilitated data collection. Representatives of the selected facilities were trained on the study methodology and the rules for filling out the data collection forms. Within a week, the team held three trainings that were attended by all the participants.

It should be noted that after the trainings, data collection was constantly monitored and facilitated, and facility-specific analysis was performed to correctly reflect the data. For convenience, all available means of communication were used (a Viber group, email, messengers, telephone).

Figure 3.1: Training for the personnel of the health facilities participating in the study

Training 1 (August 11, 2023)
Participants: 42 employees from 21 facilities

- Issues discussed: 1. Purpose of the study,2. Study methodology, 3. Facility selection criteria, 4. Table structure and guidelines for cost data reporting, 5. Organizational issues, 6. Next steps.
- Training 2 (August 16, 2023)
- Participants: 47 employees from 19 facilities
- Focused on the data to be provided.
- Training 3 (August 18, 2023)
- Participants: 25 employees from 14 facilities.
- Discussed additional issues in detail, analyzed specific cases and how they should be reflected in the study.

During the training and subsequent stages of the study, the study team identified questions about the use of telemedicine that required further clarification. Such questions can be explained by both the level of telemedicine understanding by the facility personnel and the fact that the facility resources associated with telemedicine were estimated for the first time. The questions are listed in **Annex 3**.

Data verification. The information received from the health facilities was analyzed, and the facilities were asked to clarify illogical or missing data.

When verifying the data, the study team paid attention to the following, among other things:

- If Form 1 *Introduction* contained data on investments in telemedicine devices, then Form 2 *Delivery* should contain data on their depreciation and potential maintenance costs.
- MIS maintenance costs were mandatory, and when a teleconsultation is provided, information about the patient should be entered into their MIS health record.

- The number of PCs, other hardware, and furniture had to be correlated with the number of personnel involved in telemedicine. For example, if 20 physicians provided telemedicine services in a facility, they should have 20 PCs. This number may be smaller if physicians work in shifts or not much bigger (if there are backup computers).
- If physicians used telephones owned by the facility, there should be data on the costs of communication services.
- The average monthly salary of personnel in FTE could not be below standard.
- The payroll was correlated with labor costs.

The data from public communal providers were compared with the corresponding data of their 1-HC reports submitted to NHSU. This made it possible to estimate certain indicators as a share of telemedicine in their total volume. If relative indicators had significant discrepancies compared to other facilities, they were also subject to clarification.

A small facility-level survey on using telemedicine. During the study, NHSU requested to conduct a small survey to ask facilities about the way they use telemedicine methods and tools. The questionnaire proposed by NHSU included 16 questions, and 114 physicians from 23 health facilities provided their feedback on telemedicine organization and provision, including the means used to provide telemedicine services, frequency, the procedure they used to record telemedicine services, the profile of patients, and the types of services provided remotely. Aggregated results of the survey are presented in **Annex 2**.

Analytical model for data analysis and visualization. Given the very large amount of data received from the NHSU and facilities, it was important to create a tool for convenient grouping and analysis of the data. The analytical model in Microsoft Power BI was developed specifically to combine and analyze datasets (facility-level cost data and eHealth telemedicine provision data), present results in various dashboards and produce facility-level reports.

A brief description of the analytical model functionality is provided in Table 3.1.

Table 3.1: Analytical model functions

No.	Type of analysis/report	Function
EHR analysis—type of consultations, including teleconsultations, for all health providers contracted by NHSU in 2021–2022		
1.	EHR analysis (tabular)	Presents eHealth data in tabular form making it possible to analyze quantitative characteristics in different sections
2.	EHR analysis (visualization)	Presents data in the form of bar charts for their easy comparison
3.	EHR analysis broken down by facilities	Analysis of eHealth data by health facility
4.	EHR analysis broken down by gender	Analysis of eHealth data by gender of the patients receiving telemedicine services

No.	Type of analysis/report	Function
Cost analysis for 30 selected providers		
5.	Cost analysis (summary table)	Aggregated data on costs incurred by health facilities
6.	Cost analysis by selected indicators	Indicators calculated based on the data on health facility costs
7.	Analysis of revenues by source	Analysis of revenues by sources of funding
8.	Cost analysis for 2021–2022	2021/2022 cost comparison
9.	Personnel analysis	Analysis of data on the personnel involved in telemedicine
10.	Facility profile	Analytical tab with aggregated information about each participating facility

4. FINDINGS

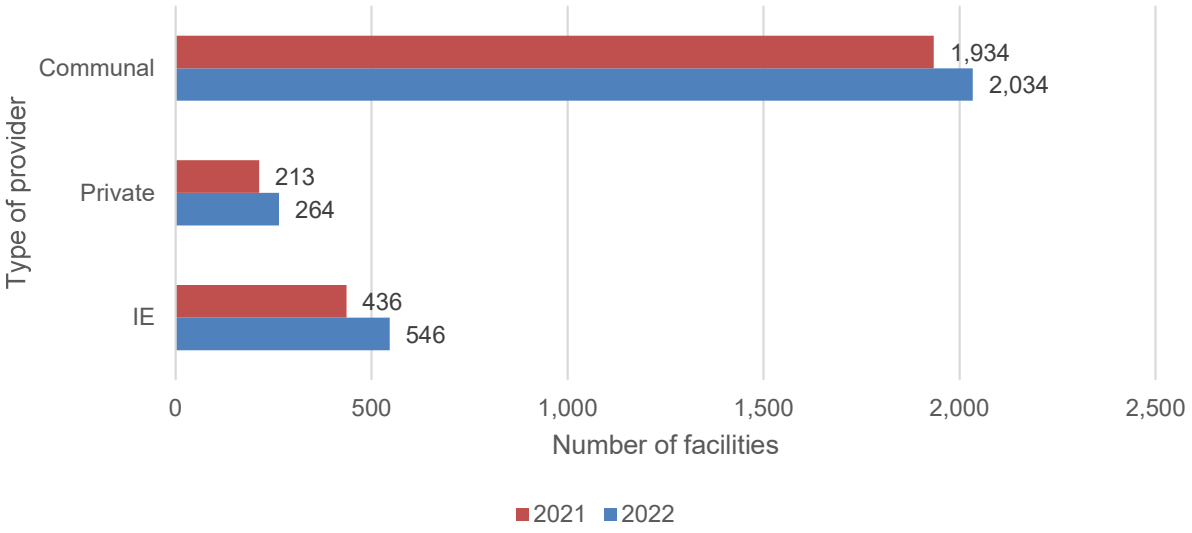
4.1. Delivering of telemedicine services by NHSU-contracted health providers in 2021–2022

- For the purposes of the study, interactions conducted by means of telecommunication recorded in eHealth are considered as doctor-to-patient teleconsultations.
- Reportedly, in 2021–2022, healthcare providers used various telemedicine methods, such as doctor-to-patient and doctor-to-doctor teleconsultations, telemetry, and teleradiology. However, only doctor-to-patient teleconsultations were recorded in eHealth.
- Seventy-one percent (2,155 out of 3,031) NHSU-contracted providers in 2021 and 88 percent (2,844 out of 3,219) in 2022 recorded at least one teleconsultation in eHealth.
- In 2021, 5.7 million teleconsultations and in 2022, 6.9 million teleconsultations wee recorded in eHealth, representing 4.3 percent and 5.2 percent, respectively, of all consultations (facility, home, and teleconsultations) recorded in eHealth.
- In 2022, the share of teleconsultations in total consultation among public communal facilities was 5 percent, among private providers was 8.5 percent, and among FOPs (individual entrepreneurs) was 8.9 percent.
- In 2022, the largest number of teleconsultations (both in absolute terms and as a share) were provided in the regions located in the frontline area (Kharkiv, Dnipropetrovsk, Luhansk, Kherson regions) and in the regions with numerous internally displaced persons (IDPs) (Lviv region and the city of Kyiv).

The study analyzed the 2021–2022 eHealth data on EHRs created by physicians based on the results of health service provision to patients. Among them, consultations conducted by means of telecommunication (defined in this study as teleconsultations) within various PMG packages were identified and analyzed.

Analysis of more than 563 million EHRs from 3,448 facilities showed that in 2021–2022, teleconsultations were provided by 2,844 facilities: in 2021, 2,583 facilities provided 5.7 million teleconsultations (4.3 percent of all consultations), and in 2022, 2,583 facilities provided 6.9 million consultations (the share of teleconsultations also increased to 5.2 percent) (**Figure 4.1**). General findings are presented in **Annex 1**.

Figure 4.1: Number of health facilities that provided teleconsultations 2021–2022 broken down by the type of provider. *Source: eHealth*



The data structure made it possible analyze the teleconsultations by:

- Type of facility
- Region
- Type of interaction (in the facility, at home, patient consultation by means of telecommunication)
- Health service packages
- Physician specialties
- Number and gender of the patients receiving services.

In 2022, NHSU contracted facilities under 41 health service packages, and teleconsultations were recorded as part of 18 health service packages, according to eHealth (Table 4.1).

Table 4.1: Number of telemedicine services and the facilities that provided them broken down by PMG packages, 2022. *Source: eHealth*

#	PMG package (number and short name)	Total facilities	Of these, facilities providing telemedicine services	Total services	Of these, telemedicine services	*Share of services per package, %*
1	01—PHC	2,240	2,010	64,677,285	5,366,536	*8.30%*
2	09—Outpatient package	1,273	1,060	56,196,039	787,041	*1.40%*
3	24—Mobile palliative care	709	537	1,011,504	401,016	*39.65%*
4	21—HIV	367	237	962,734	210,957	*21.91%*
5	20—Tuberculosis	24	20	484,788	127,650	*26.33%*
6	35—Management of pregnancy	685	311	1,554,010	17,255	*1.11%*
7	34—Dentistry	574	172	3,655,352	4,958	*0.14%*
8	22—OST	178	32	501,897	2,984	*0.59%*

#	PMG package (number and short name)	Total facilities	Of these, facilities providing telemedicine services	Total services	Of these, telemedicine services	*Share of services per package, %*
9	27—Rehabilitation of the nervous system	279	51	554,008	2,773	*0.50%*
10	39—Mobile psychiatry	49	22	124,414	2,678	*2.15%*
11	25—Child rehabilitation	98	18	150,206	2,589	*1.72%*
12	26—Rehabilitation of the musculoskeletal system	290	62	1,354,895	1,930	*0.14%*
13	41—Tuberculosis PHC	429	185	24,154	1,701	*7.04%*
14	38—Hematology	62	13	58,126	739	*1.27%*
15	17—Chemotherapy treatment	65	9	127,790	128	*0.10%*
16	37—Peritoneal dialysis	32	4	41,590	19	*0.05%*
17	18—Radiological treatment	28	2	82,139	4	*0.00%*
18	51—Psychiatric care PHC	3	1	59	1	*1.69%*
	Total	**3,219**	**2,844**	**131,560,990**	**6,930,959**	***5.2%***

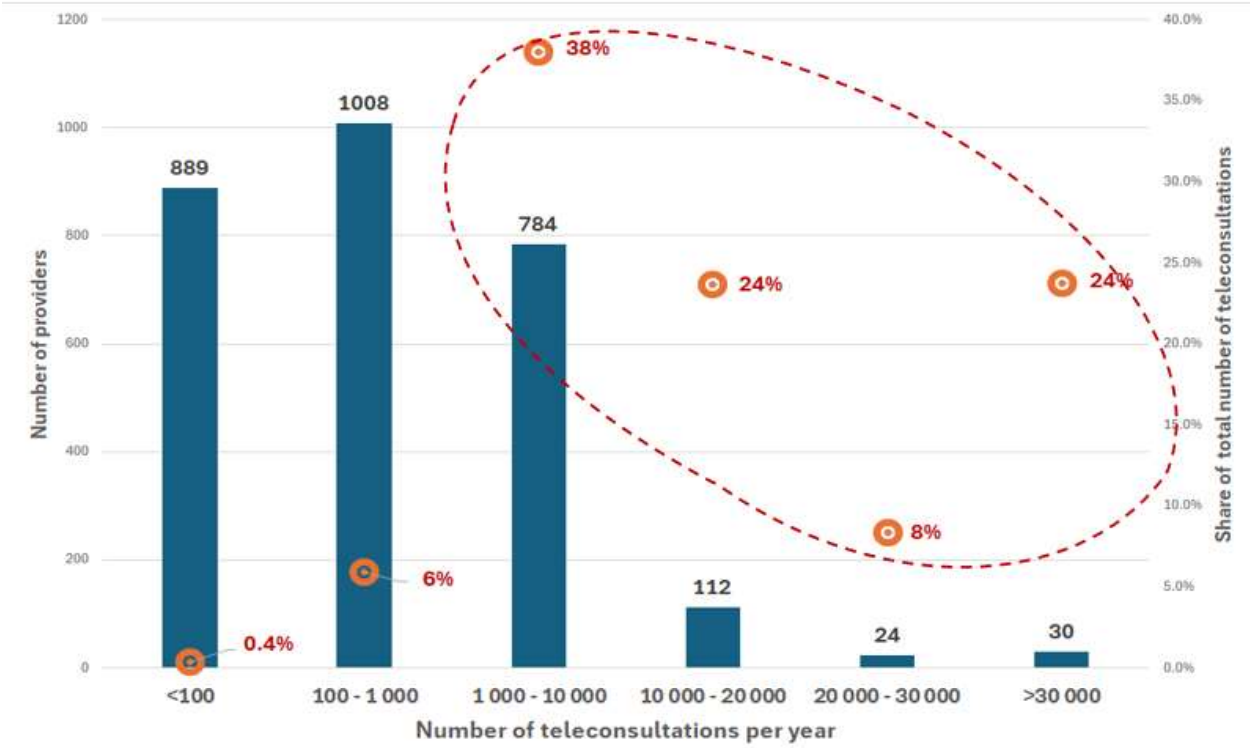
The table shows that doctor-to-patient teleconsultations, as expected, were the most common in PHC. Also, they were quite actively used to provide outpatient consultations under the Mobile Palliative Care, HIV, Tuberculosis, and Management of Pregnancy packages. Most facilities providing teleconsultations were public communal. However, private facilities and FOPs/individual entrepreneurs had a higher share of telemedicine services in the total number of services provided (Table 4.2).

Table 4.2: Number of facilities and consultations provided by them (in total and by means of telemedicine) broken down by the type of provider, 2022. *Source: eHealth*

Type of provider	Total # of facilities	Of these, facilities providing telemedicine services	Total # of services	Of these, telemedicine services	*Share of telemedicine services, %*
Public Communal	2,223	2,034	6,511,217	128,018,061	*5.09%*
Private	329	264	236,255	2,755,589	*8.57%*
FOPs	667	546	183,487	2,054,854	*8.93%*
Total	**3,219**	**2,844**	**6,930,959**	**132,828,504**	***5.22%***

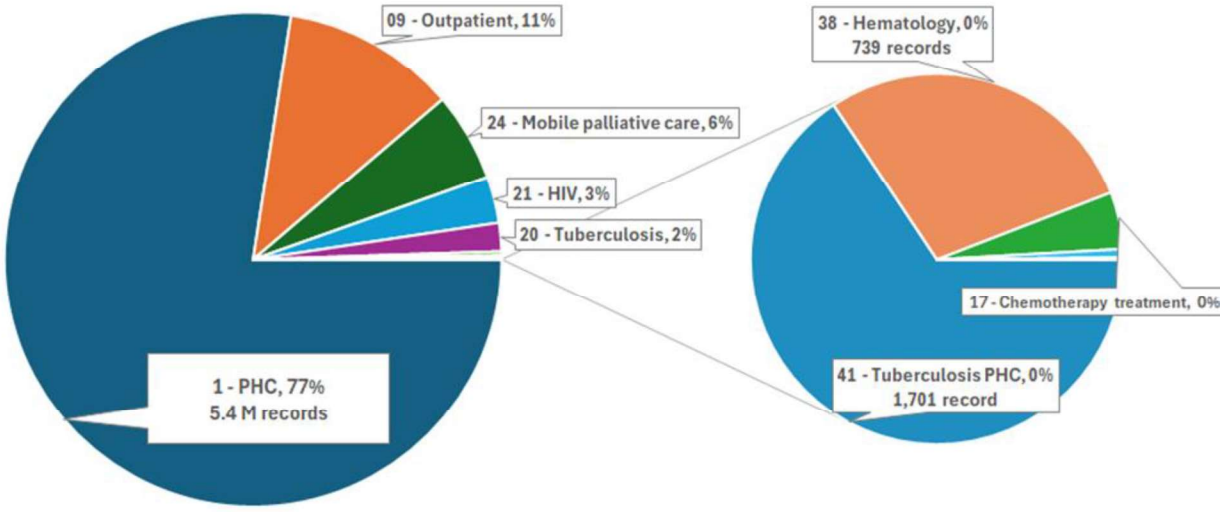
The table shows that 2,844 out of 3,219 facilities (88 percent) recorded at least one teleconsultation. At the same time, 950 out of 2,844 facilities (33 percent) provided 94 percent of all teleconsultations (Figure 4.2).

Figure 4.2: Use of teleconsultations by providers grouped by frequency of teleconsultations and total share of teleconsultations, 2022. *Source: eHealth*



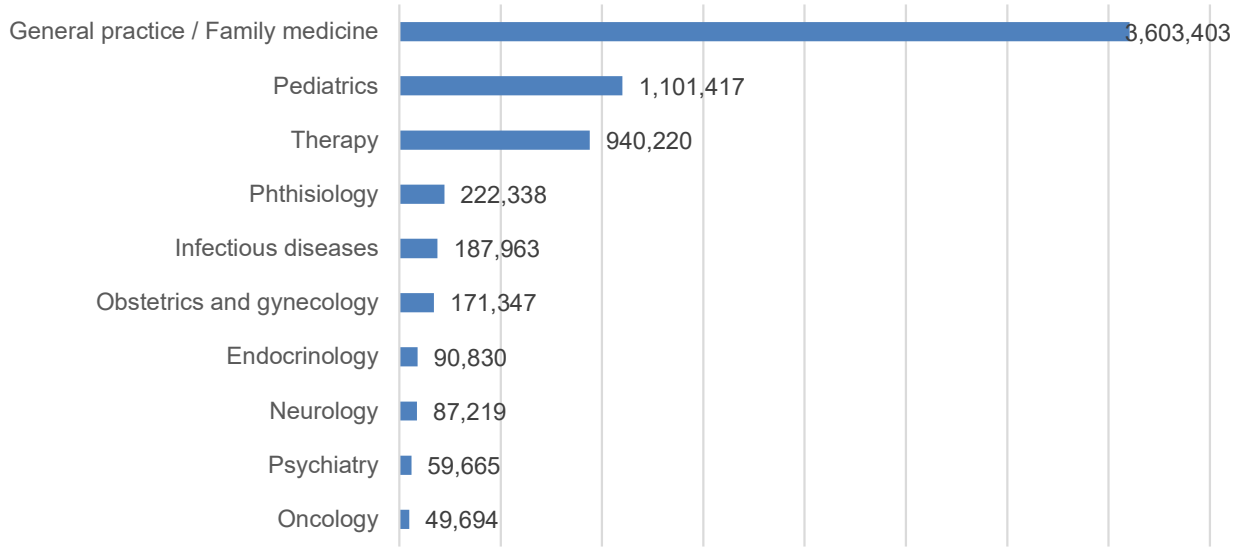
In 2022, the largest share of teleconsultations (77 percent of total teleconsultations) was recorded within the PHC package. Also, a significant number of teleconsultations were provided under the packages *Prevention, Diagnosis, Monitoring and Treatment in Outpatient Settings* (Outpatient Care), *Mobile palliative care for adults and children* (Mobile Palliative Care), *Diagnosis and Treatment of Adults and Children with Tuberculosis in Inpatient and Outpatient Settings* (Tuberculosis), and *Diagnosis, Treatment, and Follow-up of People with HIV (and Suspected HIV)* (HIV) (Figure 4.3).

Figure 4.3: PMG packages with the highest number of teleconsultations, 2022. *Source: eHealth*



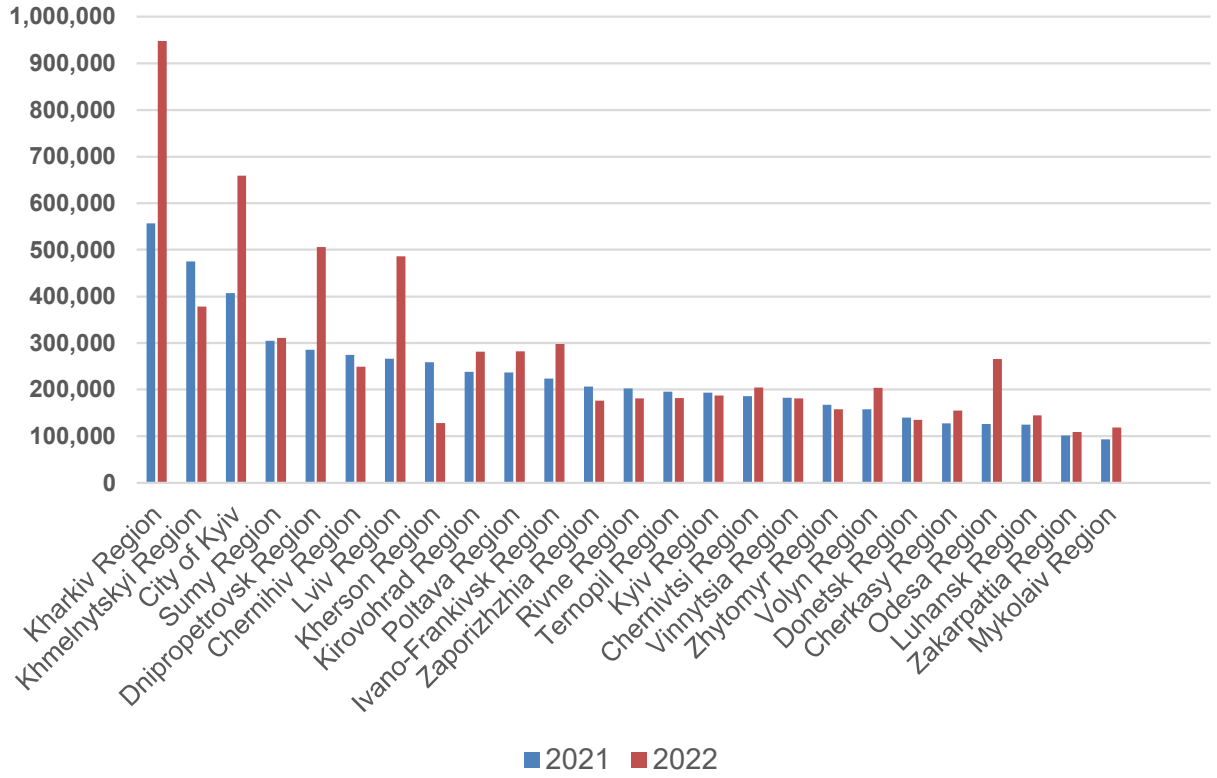
The specialties of the physicians who provided the biggest number of teleconsultations correlate with the PMG packages with the biggest number of such consultations. In particular, teleconsultations are often provided by PHC physicians, TB specialists, and infectious diseases specialists (Figure 4.4).

Figure 4.4: Medical specialties with the highest number of teleconsultations, 2022. *Source: eHealth*



Analysis of the geographical distribution of teleconsultations shows a tendency for their greater use in the frontline regions (Kharkiv, Dnipropetrovsk) and in the regions with a lot of IDPs (in particular, in Lviv region and in the city of Kyiv) (Figure 4.5).

Figure 4.5: Number of teleconsultations in the regions of Ukraine, 2021–2022. ***Source: eHealth***



4.2. Analysis of resources associated with introducing and delivering telemedicine services in the selected health facilities

The analysis of resources associated with introducing and delivering telemedicine services was based on 2022 data reported by 30 facilities and 2021 data reported by 23 facilities.

4.2.1. Investments in introduction of telemedicine services

- Sixteen out of 23 facilities in 2021 and 16 out of 30 facilities in 2022 received resources for the introduction of telemedicine services (13 public communal providers, one regional telemedicine center, and two private facilities). The share of resources associated with telemedicine introduction in total investments in 2021 and 2022 was less than 1 percent across public communal providers.
- In 2021, the lowest capitalized value of assets associated with telemedicine introduction among providers was UAH 3.0 thousand, and the highest value was UAH 761.8 thousand. In 2022, the lowest and highest values were UAH 6.0 thousand and UAH 348.6 thousand, respectively.
- In 2021, 54.8 percent of the resources for telemedicine introduction were invested by facility owners, and 21.4 percent was revenue under contracts with NHSU for PMG services. In 2022, however, 58 percent accounted for the revenue received from the NHSU and only 19 percent invested by facility owners.

- Most assets capitalized in 2022 were office workstation devices. They make up 96.5 percent of the value of all telemedicine assets at public communal providers, 70.4 percent of their value in private facilities, and 100 percent of their value in the regional telemedicine center.
- In 2021 and 2022, the facilities did not incur any costs for training their personnel or patients related to the introduction of telemedicine. However, two public communal providers offered training free of charge.
- During these two years, six out of 30 facilities purchased equipment with a data transmission function, and only one facility used its functionality in full.

Given the lack of data on the total amount of resources, purchasing and capitalization of assets in private facilities (see **Section 2.2** for more details on these and other limitations of the study), there is no estimate of the respective share of investments/assets associated with telemedicine introduction in these facilities.

The total value of assets associated with introducing telemedicine services in 2022 amounted to UAH 2,082.3 thousand, including UAH 1,814.4 thousand in public communal providers, UAH 166.4 thousand in the regional telemedicine center, and UAH 101.5 thousand in private facilities (Table 4.3).

Table 4.3: Investments (sources and assets) associated with introducing telemedicine services by the type of provider, 2022, UAH thousand. ***Sources: facility data and 1-HC reports***

Type of provider	#. of facilities		Amount of resources, thousand UAH (data from Table 1 of the 1-HC report)	Cost of assets, such as inventories and capital investments, UAH thousand (data from Tables 1, 2 of the 1-HC report)	Cost of assets associated with introducing telemedicine services, thousand UAH
	Total	Facilities that received telemedicine assets			
1	2	3	4	5	6
Public Communal	23	13	3,516,738.3	1,045,908.5	1,814.4
Public Communal - Regional Telemedicine Center	1	1	886,175.8	372,258.7	166.4
Private	6	2	X	X	101.5
Total	**30**	**16**	**X**	**X**	**2,082.3**

In public communal providers(N=13), the share of telemedicine introduction resources (percentage of column 6 from column 4) averaged 0.05 percent with a maximum of 0.48 percent; in the regional telemedicine center, the share was 0.02 percent. In the same facilities, the share of costs incurred to acquire telemedicine assets (percentage of column 6 from column 5) averaged 0.17 percent with a maximum of 2.3 percent; in the regional telemedicine center, the share was 0.04 percent.

The amount of resources invested in facilities (in total and for telemedicine introduction) is **shown in Figure 4.6** and **Figure 4.6**.

Figure 4.6: Resources invested in public communal facilities, 2022, UAH million. ***Source: 1-HC reports***

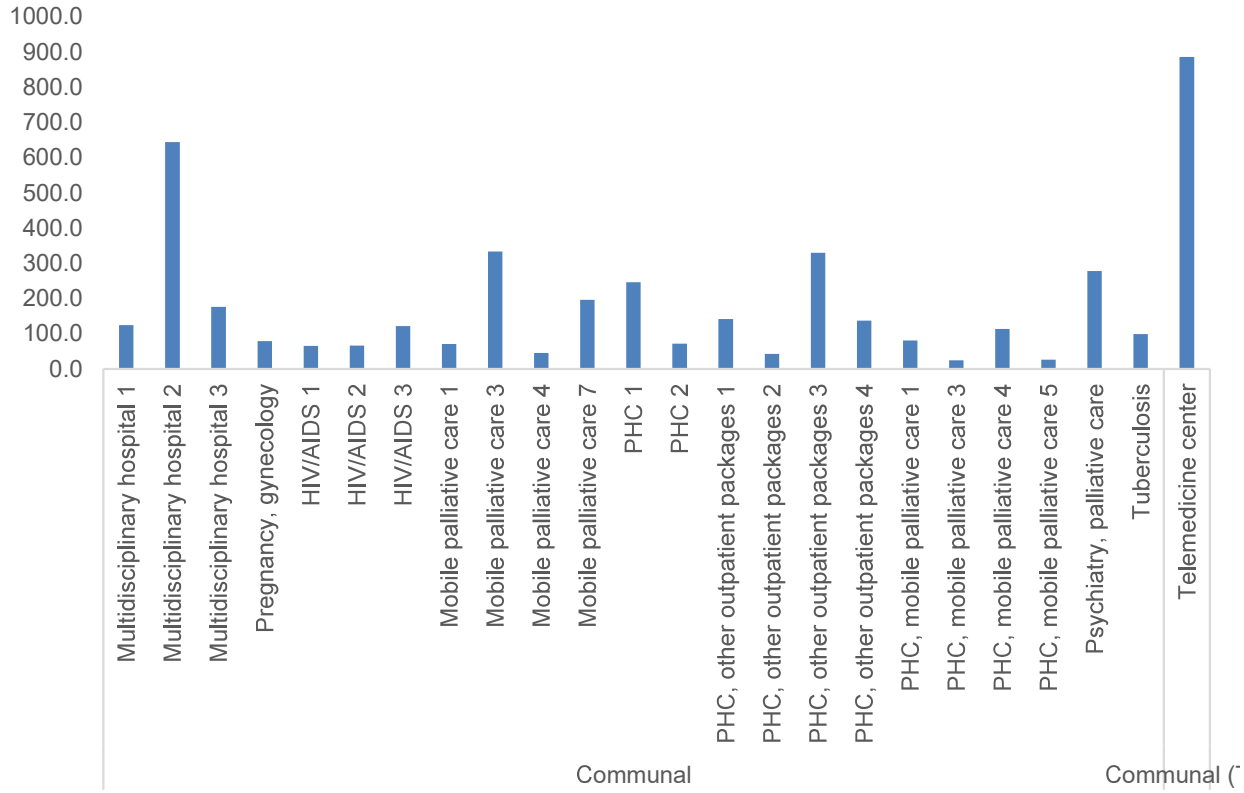
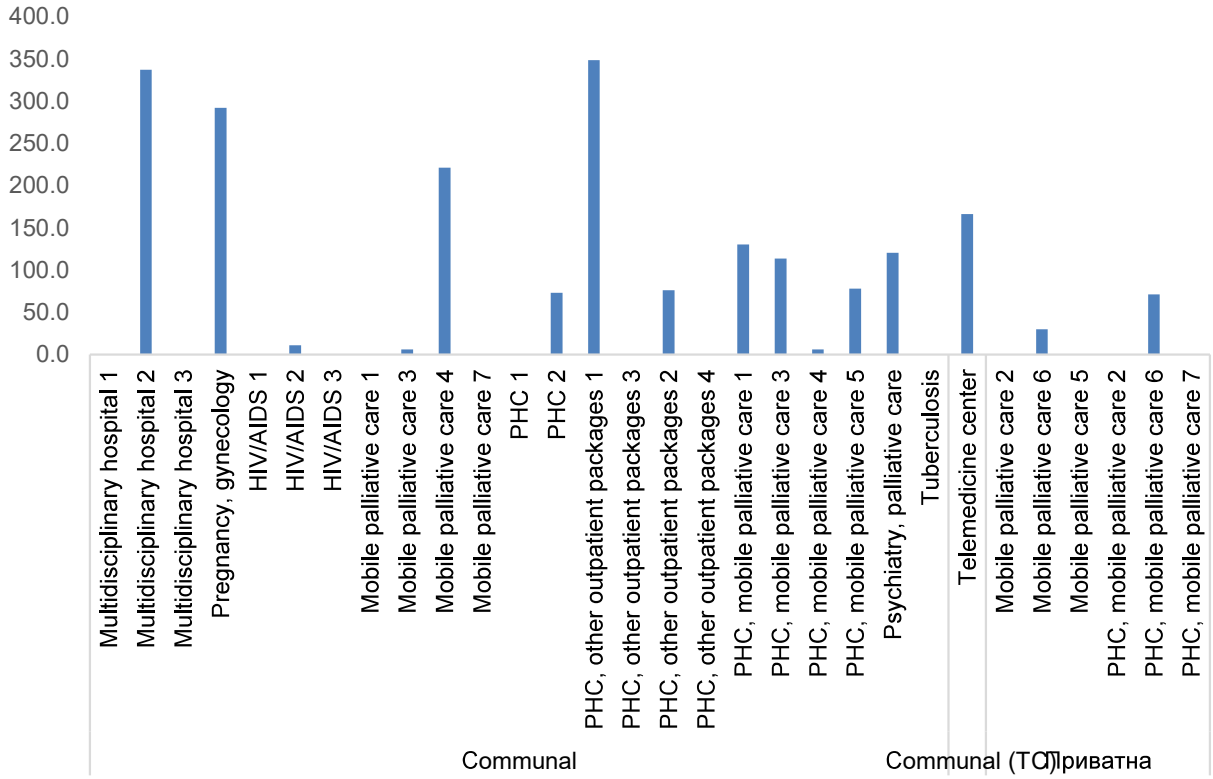


Figure 4.7 shows that in 2022, two facilities out of 30 had the **smallest** amount of capitalized telemedicine assets (UAH 6 thousand in each facility). Both facilities are CNEs with the Mobile Palliative Care package, where cell phones were purchased for members of mobile palliative care teams so that they could communicate with patients online.

The **largest** investment in telemedicine services (UAH 348.6 thousand) was made by a municipal children's polyclinic, which purchased office devices and furniture for its personnel involved in telemedicine. The facility provides teleconsultations to patients only by phone. For this purpose, physicians use video communication and receive video recordings on their phones.

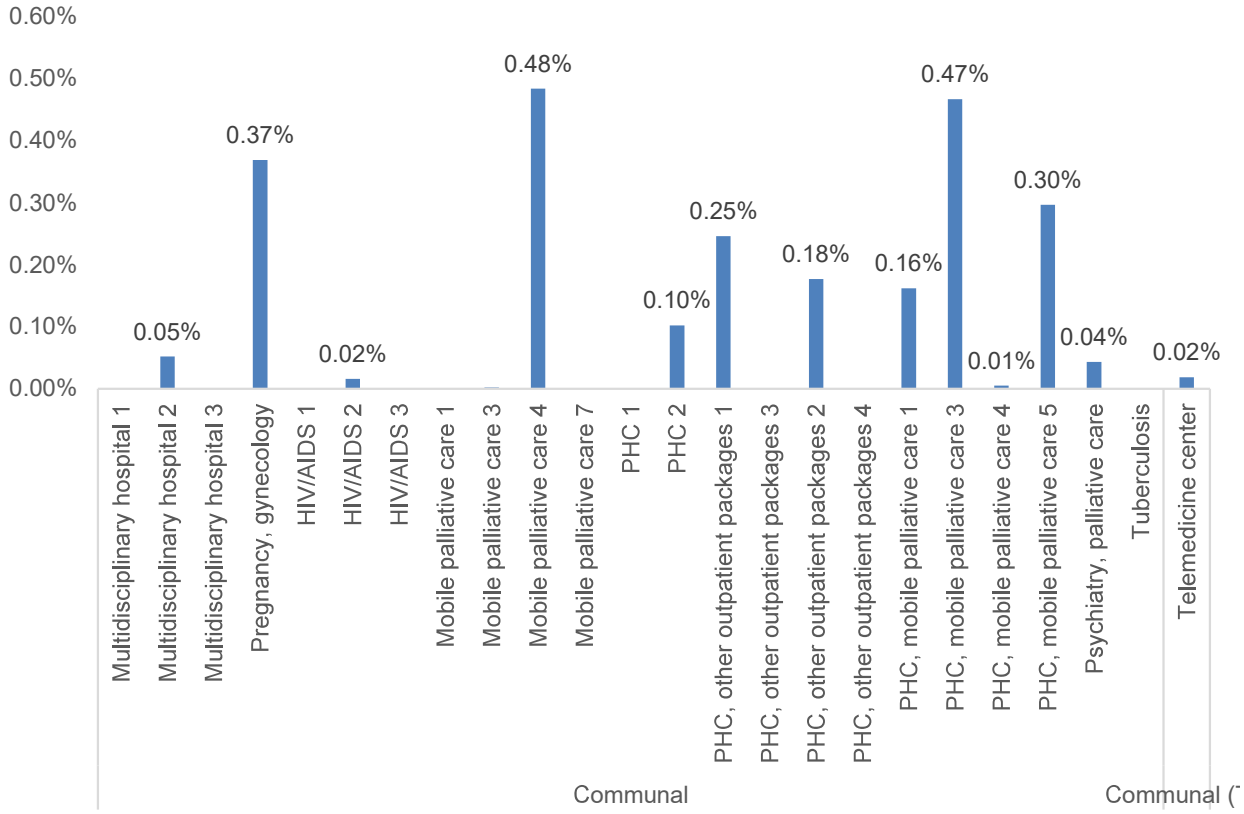
Figure 4.7: Value of assets used by health facilities to introduce telemedicine services, 2022, UAH thousand. ***Source: facility fata***



The figure shows that the value of telemedicine introduction was different and did not depend on the total amount of resources.

In 2022, there was not a single facility where the share of total resources for telemedicine development would reach 0.5 percent (**Fig. 4.2.1.3**). This share was highest in a district hospital (0.48 percent or UAH 221.1 thousand). In 2020, the facility opened the first mobile palliative care service in the region; the number of patients gradually increased, so they hired more physicians and nurses, and the indicated amount of resources was spent to purchase office devices.

Figure 4.8: Share of assets used by communal facilities to introduce telemedicine services, resources, 2022. *Sources: facility data and 1-HC reports*



The assets capitalized in 2022 are shown in Table 4.4.

Table 4.4: Value of assets capitalized and used by facilities to introduce telemedicine services broken down by the type of provider and cost items, UAH thousand, 2022. *Source: facility data*

No.	Items of asset formation costs	Value of assets associated with introducing telemedicine services						
		Total, thousand UAH	including by the type of provider					
			Public Communal	*structure, %*	RTC	*structure, %*	Private facilities	*structure, %*
	Total	**2,082.3**	**1,814.4**	***100.0%***	**166.4**	***100.0%***	**101.5**	***100.0%***
1.	Hardware	58.0	58.0	*3.2%*	0.0	*0.0%*	0.0	*0.0%*
1.1.	Medical diagnostic equipment with data transmission function	58.0	58.0	*3.2%*	0.0	*0.0%*	0.0	*0.0%*
1.2.	Mobile telemedicine diagnostic complexes	0.002	0.002	*0.0%*	0.0	*0.0%*	0.0	*0.0%*
2.	Office workstation devices	1,988.7	1,750.8	*96.5%*	166.4	*100%*	71.5	*70.4%*
2.1.	PCs, multimedia devices, printers, networking hardware, and other.	1,389.0	1,317.5	*72.6%*	0.0	*0.0%*	71.5	*70.4%*
2.2.	Uninterruptible power supplies	181.0	14.6	*0.8%*	166.4	*100.0%*	0.0	*0.0%*

No.	Items of asset formation costs	Value of assets associated with introducing telemedicine services						
		Total, thousand UAH	including by the type of provider					
			Public Communal	*structure, %*	RTC	*structure, %*	Private facilities	*structure, %*
	Total	**2,082.3**	**1,814.4**	***100.0%***	**166.4**	***100.0%***	**101.5**	***100.0%***
2.3.	Office furniture	418.7	418.7	*23.1%*	0.0	*0.0%*	0.0	*0.0%*
3.	Software	30.0	0.0	*0.0%*	0.0	*0.0%*	30.0	*29.6%*
3.1.	MIC license	30.0	0.0	*0.0%*	0.0	*0.0%*	30.0	*29.6%*
4.	IT infrastructure	5.6	5.6	*0.3%*	0.0	*0.0%*	0.0	*0.0%*
4.1.	Communication networks	5.6	5.6	*0.3%*	0.0	*0.0%*	0.0	*0.0%*

The table shows that in 2022, the following items were purchased and obtained:

1) Medical equipment worth UAH 58 thousand: one Teladoc software and hardware complex that creates the effect of virtual presence of a physician near the patient (UAH 58 thousand), and two CTG Sigmafon telemedicine systems for pregnant women (capitalized in the amount of UAH 2).[7]

2) Office workstation devices worth UAH 1,988.7 thousand:

2.1) PCs, multimedia devices, printers, networking hardware, and other in the amount of UAH 1,389.0 thousand, namely:

- Eleven facilities (both communal and private) purchased or received **personal computers** (monoblock, laptop, tablet, computer), PC parts (monitor, system unit, and other) worth UAH 1,045.4 thousand
- Five facilities (both communal and private) purchased 15 **multimedia** devices worth UAH 61.8 thousand. These are mostly cell phones for employees who used them to provide services to patients. Facilities purchased from one to four multimedia devices.
- Nine facilities (both communal and private) reported obtaining **printers** (multifunctional device, printer, scanner, other scanning/printing devices) worth UAH 276.4 thousand. These printers were used by the employees providing telemedicine services. The facilities made their own decisions on how to reflect such data in terms of their use for the delivery of telemedicine services. Most of them explained that they printed out information based on the results of telemedicine consultations or scanned information and sent it to other physicians, if necessary.
- **Networking hardware** (modem, router, WiFi adapter, switches) was purchased in 2022 by one facility (public communal) for the amount of UAH 4.2 thousand.

[7] In 2021–2022, six out of 30 health facilities received medical diagnostic equipment with data transmission function, including mobile diagnostic and telemetry systems. One facility purchased the equipment under PMG and used its functions in full, but infrequently. The other five facilities received the equipment free of charge; two of them did not use it at all, and three facilities used it without the data transmission function (see Table 4.8).

- One facility purchased a **hard magnetic disk** worth UAH 1.1 thousand,

2.2) **Uninterruptible power supplies** worth UAH 181.0 thousand were purchased by four facilities, including public communal and the regional telemedicine center.

2.3) Six facilities (public communal) purchased **office furniture** worth UAH 418.7 thousand intended for the personnel involved in telemedicine.

2.4) **MIS license** amounting to UAH 30 thousand was purchased by one private facility.

2.5) One facility purchased materials for the setup of a local (cable) network for telecommunication service providers amounting to UAH 5.6 thousand.

Regional telemedicine center investments (2019–2022)

The regional telemedicine center received the main part of assets for the introduction of telemedicine services from Odesa Regional Council in the amount of UAH 2,583.0 thousand when it was established in 2019. In the same year, 25 center employees and physicians were trained on the new workflow of delivering telemedicine services, the cost of training amounted to UAH 49.5 thousand. In total, the cost of telemedicine service introduction amounted to UAH 2,632.5 thousand.

In 2019, the assets had the following structure:

- Hardware (PCs, multimedia devices, printers, networking hardware, inventory for communication setup)—UAH 513.1 thousand or 19.5 percent of the cost of telemedicine service introduction
- Office furniture—UAH 240.5 thousand, or 9 percent
- Windows license—UAH 68.0 thousand, or 2.6 percent
- Connection of the main and backup Internet lines—UAH 49.8 thousand or 1.9 percent
- Server—UAH 32.2 thousand or 1.2 percent
- Major renovation of the telemedicine center premises—UAH 1,679.3 thousand or 63.8 percent.

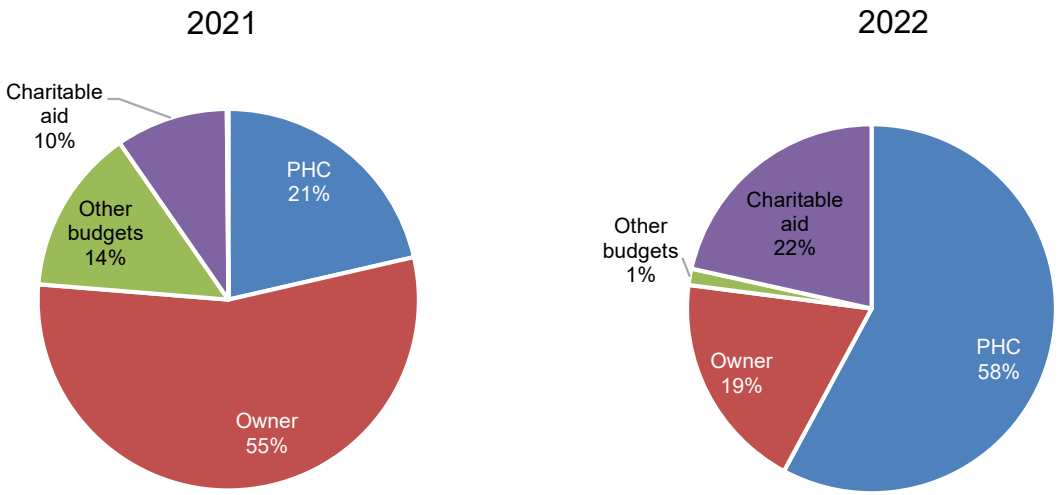
In 2020, the regional telemedicine center received two more groups of servers, a data storage system, a technical support subscription, and software worth UAH 1,527.8 thousand from the same source.

In 2021, the regional telemedicine center did not receive or purchase any assets.

In 2022, uninterruptible power supplies were purchased under PMG. They cost UAH 166.4 thousand, which amounted to 0.02 percent of the facility's revenues as a legal entity (a public communal facility).

In 2022 (N=16) and 2021 (N=16), the sources of funding for telemedicine introduction assets differed significantly (Figure 4.9).

Figure 4.9: Sources of funding for telemedicine introduction assets, 2021–2022, %. ***Source: facility data***



As can be seen from Table 4.5**,** below, in 2021, both communal and private facilities received more than half of the value of assets from the facility owner (founder). In 2022, the assets were purchased under PMG.

Analysis of the data showed that in 2021, four facilities (three communal and one private) received assets for telemedicine introduction from the facility owner in the amount of UAH 1,622.3 thousand (54.9 percent of total revenue):

- Office workstation devices worth UAH 418.8 thousand for a multidisciplinary hospital
- Six mobile diagnostic systems worth UAH 652.0 thousand with office workstation devices worth UAH 93.7 thousand for a primary healthcare center
- Office furniture worth UAH 16.6 thousand for another primary healthcare center
- When a private facility was opened, its owner purchased office workstations for six employees worth UAH 441.3 thousand.

In 2022, only two owners of public communal **facilities invested their own funds in telemedicine** in the amount of UAH 399.7 thousand (**19.2 percent of total revenue**). One of the owners continued providing the multidisciplinary hospital employees with office workstations worth UAH 279.2 thousand. The other owner purchased office workstations for the psychiatric hospital employees worth UAH 120.5 thousand.

In 2021, 12 facilities purchased assets for the amount of UAH 633.1 thousand (**21.4 percent of total telemedicine investment**) under PMG. These were mostly small investments (from UAH 3 thousand to UAH 68 thousand), and only two facilities purchased assets for a larger amount (UAH 145.3 thousand and UAH 220.0 thousand respectively). **In 2022, this number increased to 14 facilities,** and they made a total telemedicine investment in the amount of UAH 1,205.0 thousand, which was **almost 58 percent of total investment**, ranging from UAH 6 thousand to UAH 348.6 thousand per facility.

In 2021, only three out of 16 facilities received telemedicine investments through charitable aid in the amount of UAH 18.5 thousand to UAH 187.9 thousand. In 2022, five facilities received charitable aid in the amount of UAH 1.2 thousand to UAH 181.4 thousand.

Table 4.5: Value of assets associated with telemedicine introduction broken down by the type of provider and sources of funding, 2019–2022, UAH thousand. ***Source: facility data***

Type of provider	Facilities that reported assets for telemedicine introduction	Value of assets for telemedicine introduction, thousand UAH	Including by sources of funding, thousand UAH				
			PMG	Owner	Other Budgets	Charitable Aid	Other Sources*
2022, total	**16**	**2,082.3**	**1,205.0**	**399.7**	**29.9**	**447.8**	
Structure, %		*100.0%*	*57.9%*	*19.2%*	*0.2%*	*21.5%*	
Communal	13	1,814.4	937.1	399.7	29.9	447.8	
Structure, %		*100.0%*	*51.6%*	*22.0%*	*0.1%*	*24.7%*	
Communal (RTC)	1	166.4	166.4				
Structure, %		*100.0%*	*100.0%*				
Private	2	101.5	101.5				
Structure, %		*100.0%*	*100.0%*				
2021, total	**16**	**2,956.2**	**633.1**	**1,622.3**	**415.7**	**281.6**	**3.5**
Structure, %		*100.0%*	*21.4%*	*54.9%*	*14.1%*	*9.5%*	*0.1%*
Communal	14	2,496.4	614.6	1,181.1	415.7	281.6	3.5
Structure, %		*100.0%*	*24.6%*	*47.3%*	*16.7%*	*11.3%*	*0.1%*
Communal (RTC)		0.0					
Structure, %							
Private	2	459.8	18.5	441.3			
Structure, %		*100.0%*	*4.0%*	*96.0%*			
2020 Communal (RTC)	**1**	**1,527.8**			**1,527.8**		
Structure, %		*100.0%*			*100.0%*		
2019 Communal (RTC)	**1**	**2,632.5**			**2,632.5**		
Structure, %		*100.0%*			*100.0%*		

** Other sources of funding: delivery of medical and non-medical services at the expense of individuals and legal entities, receipt of insurance payments, rental of property, compensation for utility payments from the tenant, bank interest on deposits, proceeds from the sale of scrap metal, refunds of claims from courts, refunds of business trips, and other.*

4.2.2. Resources to deliver telemedicine services

To analyze the data on telemedicine service delivery, the study team considered the operational and service costs at the facility level: labor costs of the personnel involved in telemedicine, training of the personnel and patients, technical support, maintenance, training, servicing of the hardware and software, rental of medical equipment, and premises for telemedicine.

We conducted two types of analysis:

1) **full costs analysis**, i.e., the costs of supporting and maintaining telemedicine , including full-time salary with the unified social contribution and depreciation of fixed assets

2) **adjusted costs analysis,** i.e., the costs of supporting and maintaining telemedicine, including salary with the unified social contribution accrued for the period of telemedicine delivery **and** excluding depreciation.

One of the cost items related to telemedicine service delivery is labor costs (including unified social contribution) of employees whose functions are related to telemedicine. The amount of these costs did not depend on whether the employees actually performed telemedicine-related functions, except for the regional telemedicine center, which pays physicians for providing doctor-to-doctor consultations. Also, the facilities usually do not create a depreciation fund for the reproduction of fixed assets.

It should be noted that for the regional telemedicine center, unlike other facilities, labor costs were calculated only for the period during which doctor-to-doctor telemedicine services were provided instead of the total period of time for which salary was accrued. The telemedicine center (which is a department under hospital) was analyzed, not the entire hospital.

- All facilities in 2021 (N=23) and 2022 (N=30) had costs associated with telemedicine delivery.
- In 2021 and 2022, most telemedicine delivery costs were covered by the revenue received from NHSU under PMG (98.9 percent in 2021 and 99.5 percent in 2022 on average).
- The share of telemedicine costs in total costs varied significantly among facilities in 2021 and 2022, but the minimum and maximum shares did not change and ranged from 0.6 percent to 47 percent. The proportion of adjusted telemedicine costs (excluding depreciation and including the recalculated labor costs in FTE) in total costs without depreciation varied among facilities and ranged from 0.03 percent to 2 percent in 2021 and from 0.04 percent to 10.5 percent in 2022.
- In 2021, the lowest telemedicine delivery costs were UAH 99.8 thousand and the highest costs amounted to UAH 30.9 million. In 2022 these were UAH 215.4 thousand and UAH 54.8 million, respectively. However, the adjusted costs were much lower and ranged from UAH 7.8 thousand to UAH 4.3 million in 2021, and from UAH 40.4 thousand to UAH 4.2 million in 2022.
- In the structure of total telemedicine delivery costs, labor costs had the largest share. In different facilities, it ranged from 84 percent to 100 percent in 2021 and from 86 percent to 100 percent in 2022. When adjusted, it ranged from 5 percent to 100 percent and from 42 percent to 100 percent, respectively.

Given the lack of data on total resources and total operating costs in private facilities (see **Section 2.2** for more details on these and other limitations of the study), there is no estimate of their share of telemedicine delivery resources.

In 2022, all facilities (N=30) had telemedicine delivery costs with a total amount of UAH 283,655.2 thousand. In communal facilities (N=23), these costs amounted to UAH 272,960.8 thousand which is an average of 7.8 percent of their total resources and 10 percent of total costs. The corresponding costs of the regional telemedicine center amounted to UAH 4,444.8 thousand which is 0.5 percent of the revenues and 0.6 percent of the corresponding costs. The costs of private facilities (N=6) amounted to UAH 6 249.6 thousand (Table 4.6).

Table 4.6: Telemedicine delivery costs, total resources, and costs of facilities by the type of provider, 2022, UAH thousand. ***Sources: facility data and 1-HC reports***

Type of provider	No. of facilities	Amount of resources, thousand UAH (data from Table 1 of the 1-HC report)	Total operating costs, thousand UAH (data from Table 5.1 of the 1-HC report)	Telemedicine delivery costs, thousand UAH	Total operating costs before depreciation, thousand UAH (data from Table 5.1 of the 1-HC report)	Adjusted telemedicine delivery costs, UAH thousand
1	2	3	4	5	6	7
Public Communal	23	3,516,738.3	2,738,724.9	272,960.8	2,602,443.1	22,352.4
Communal (RTC)*	1	886,175.8	798,854.4	4,444.8	783,972.0	4,235.4
Private	6	x	x	6,249.6	x	663.6
Total	**30**	**x**	**x**	**283,655.2**	**x**	**27,251.4**

* Regional telemedicine center.

It should be noted that some of the equipment received in previous years and used to deliver telemedicine services may be 100 percent worn out and therefore may not be recognized as a cost item. Some facilities reported such cases about office devices.

The total amount of adjusted telemedicine delivery costs in 2022 amounted to UAH 27,251.4 thousand which is 9.6 percent of total costs.

The adjusted telemedicine delivery costs of public communal providers amounted to UAH 22,352.4 thousand (8.2 percent of total costs) or to 0.6 percent of total revenues of the facilities on average and 0.9 percent of total operating costs without depreciation. The proportion of adjusted telemedicine cost in total costs without depreciation also varied among the facilities and ranged from 0.04 percent to 10.5 percent. The adjusted costs of the regional telemedicine center amounted to UAH 4 235.4 thousand (95.3 percent of total costs, solely due to the absence of depreciation), which is 0.5 percent of the revenues and 0.5 percent of the relevant costs. The adjusted costs of private facilities amounted to UAH 663.6 thousand which is 10.6 percent of total costs (**Fig. 4.2.2.1**).

Figure 4.10: Total operating costs of communal facilities, 2022, UAH million. *Source: 1-HC reports*

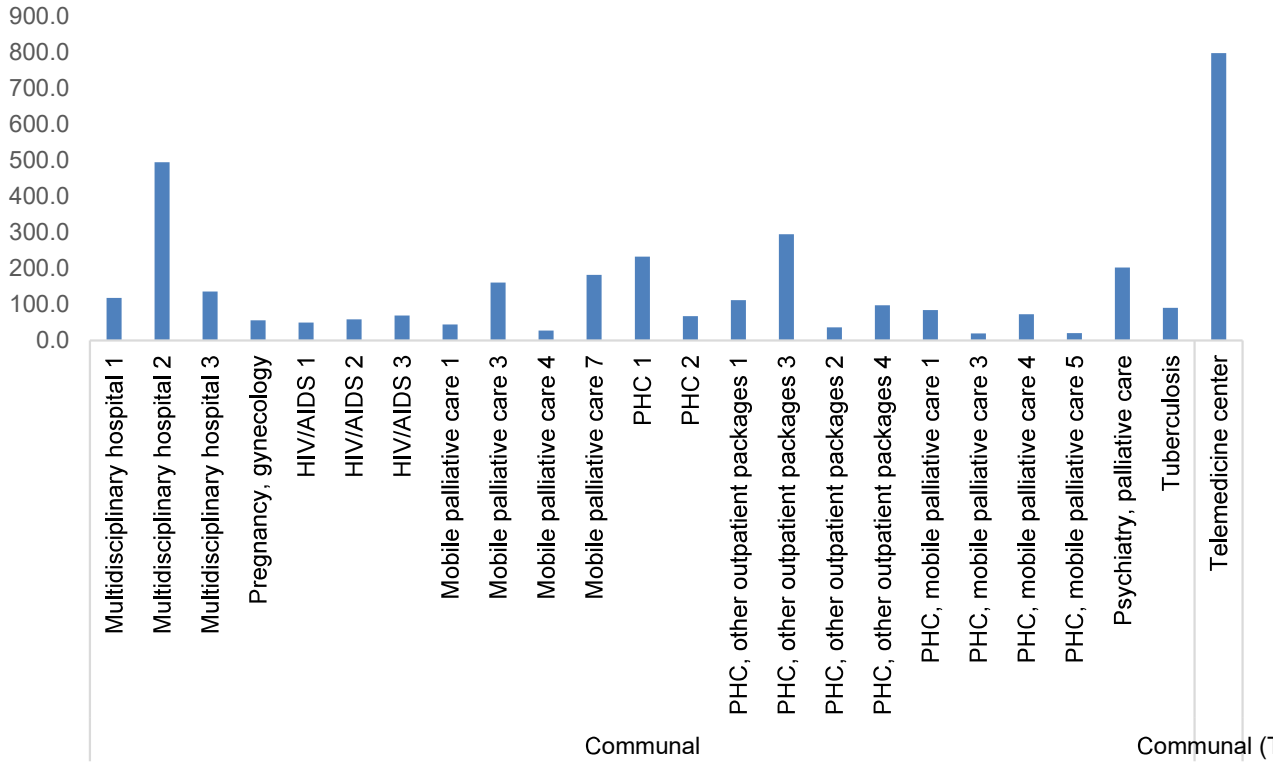
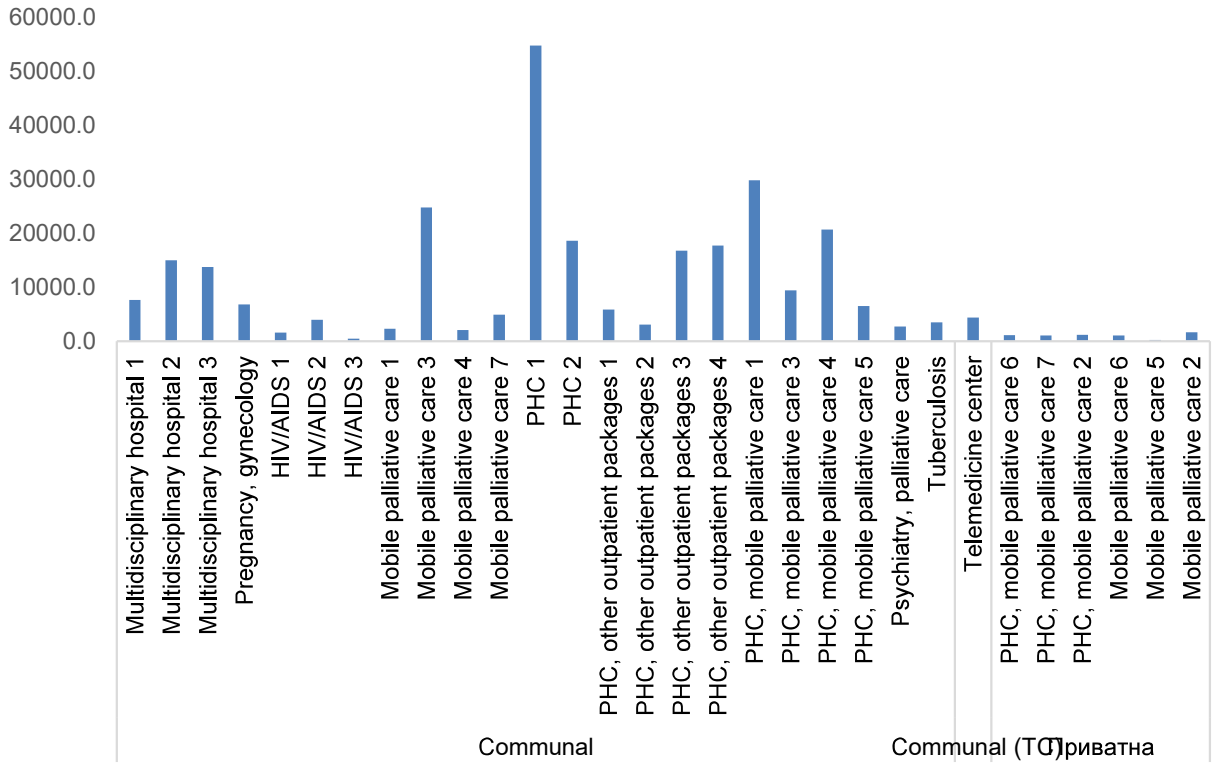
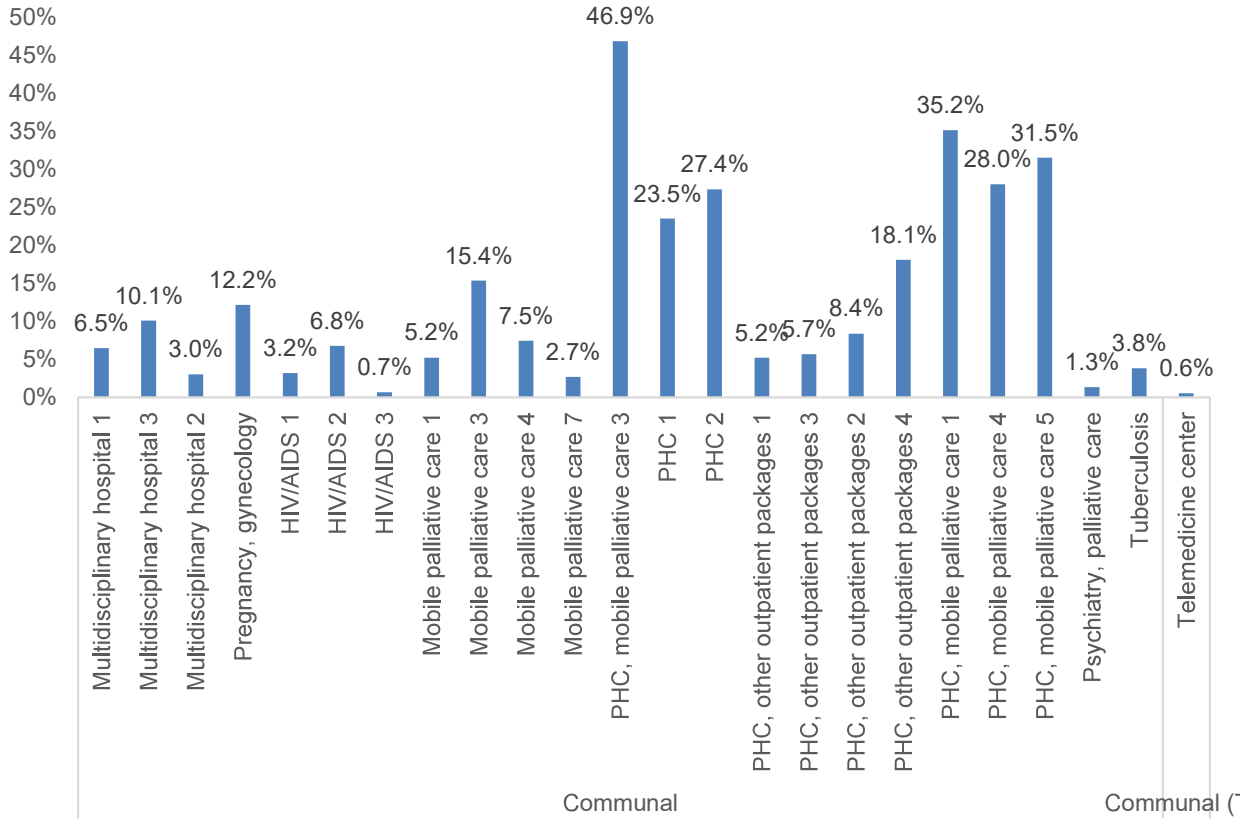


Figure 4.11: Telemedicine delivery costs, 2022, UAH thousand. *Source: facility data*



In 2022, telemedicine delivery costs varied significantly between facilities from UAH 215.4 thousand to UAH 54.8 million.

Figure 4.12: Share of telemedicine delivery costs of total costs of communal facilities, 2022. ***Source: facility data and 1-HC reports***



The share of telemedicine delivery costs in total costs of the facilities in 2022 ranged from 0.6 percent to 47 percent.

The proportion of adjusted telemedicine costs of public communal providers in total costs without depreciation also varied among the facilities and ranged from 0.04 percent to 10.5 percent.

The adjusted costs of facilities in 2021 (N=23) ranged from UAH 7.8 thousand to UAH 4,267.0 thousand, in 2022 (N=30) from UAH 40.4 thousand to UAH 4,235.3 thousand.

Private facilities had the **lowest telemedicine delivery costs.** Their total costs amounted to **UAH 215.4 thousand**, adjusted costs to **UAH 40.9 thousand**. They did not purchase any assets for telemedicine delivery in 2022. During the year, they had 3.4 thousand interactions with patients, one-third of them (1.1 thousand) were telemedicine services covered in full under the Mobile Palliative Care package (350 interactions were recorded in eHealth in 2021). Teleconsultations were provided by two outpatient physicians (adult and pediatric neurologists) under the Mobile Palliative Care package, who used their own mobile phones without reimbursement for communication costs. Two or three times a week, they called patients and during the conversation (20–30 minutes) collected data on the patient's condition, provided advice, prescribed or adjusted treatment, and other.

Outside PMG, the facility delivered specialized care in gynecology, obstetrics, pediatrics, ophthalmology, and neurology on a commercial basis. The facility rented premises with furniture and equipment. Annual rent amounted to UAH 480 thousand, but it was not included in telemedicine costs. The facility's costs were distributed as follows:

- **UAH 207 thousand:** labor costs of two physicians. If they delivered telemedicine services full time, the costs would amount to **UAH 32.5 thousand.**[8]
- **UAH 8.4 thousand:** cost of Health 24 MIS support and maintenance without the telemedicine module, fixed payment for two physicians at UAH 350 per month.

A municipal urban polyclinic had **the largest telemedicine delivery costs.** In 2022, all the physicians of the facility (146 persons) provided telemedicine services but spent an average of 1.2 percent of their working time on it. The physicians provided consultations using their own phones without reimbursement for communication costs. Also, some physicians use the telemedicine module of the MIS.

In 2022, the facility recorded 603.6 thousand interactions, of which 17.5 thousand, or 3 percent, were delivered via telemedicine. The largest number of telemedicine services (14.6 thousand or 84 percent) were delivered under the PHC package. Also, telemedicine services were delivered under the Outpatient Care, Mobile Palliative Care, and Management of Pregnancy packages.

In 2021, the facility purchased two portable telecommunication diagnostic systems for UAH 220 thousand under PMG to send data of complex clinical cases to narrow specialists of the polyclinic. This equipment was rarely used. The facility was unable to separate the communication costs incurred during the operation of these systems, and there were no costs for their maintenance (the systems were purchased at the end of 2021, and in 2022 the supplier company located in Kharkiv did not issue invoices due to the full-scale invasion). The facility did not receive any other telemedicine assets in 2021 or 2022. In 2022, total telemedicine costs amounted to UAH 54,794.8 thousand, and adjusted costs to UAH 1,238.2 thousand:

- **UAH 53,886.6 thousand:** annual labor costs of 146 physicians; if they delivered telemedicine services full time, the costs would amount to **UAH 664.0 thousand**[9],
- **UAH 22.0 thousand:** depreciation of two portable telecommunication diagnostic systems,
- **UAH 292.0 thousand:** depreciation of computers,
- **UAH 594.2 thousand:** MIS support and maintenance.

The primary healthcare center had **the largest share of telemedicine delivery costs.** In 2021, these costs amounted to UAH 7,367.0 thousand or 46.8 percent of total costs of the facility. In 2022, they amounted to UAH 9,406.8 thousand or 46.9 percent of total costs of the facility. Half of the facility's employees (38 persons in 2021 and 39 persons in 2022 out of a total of 76 persons) were involved (to varying degrees) in telemedicine service delivery, including physicians, nurses, and a psychologist. As a result, salaries of

[8] Calculation: UAH 207 thousand x 15.72% = UAH 32.5 thousand; 15.72% = 200 (*man-hours of telemedicine-related services delivery*) x 100 / 1,272 (*man-hours for which salaries were charged*).

[9] Calculation: UAH 53,886.6 thousand x 1.2% = UAH 664.0 thousand; 1.2% = 2,908 (*man-hours of telemedicine-related services delivery*) x 100 / 243,323 (*man-hours for which salaries were charged*).

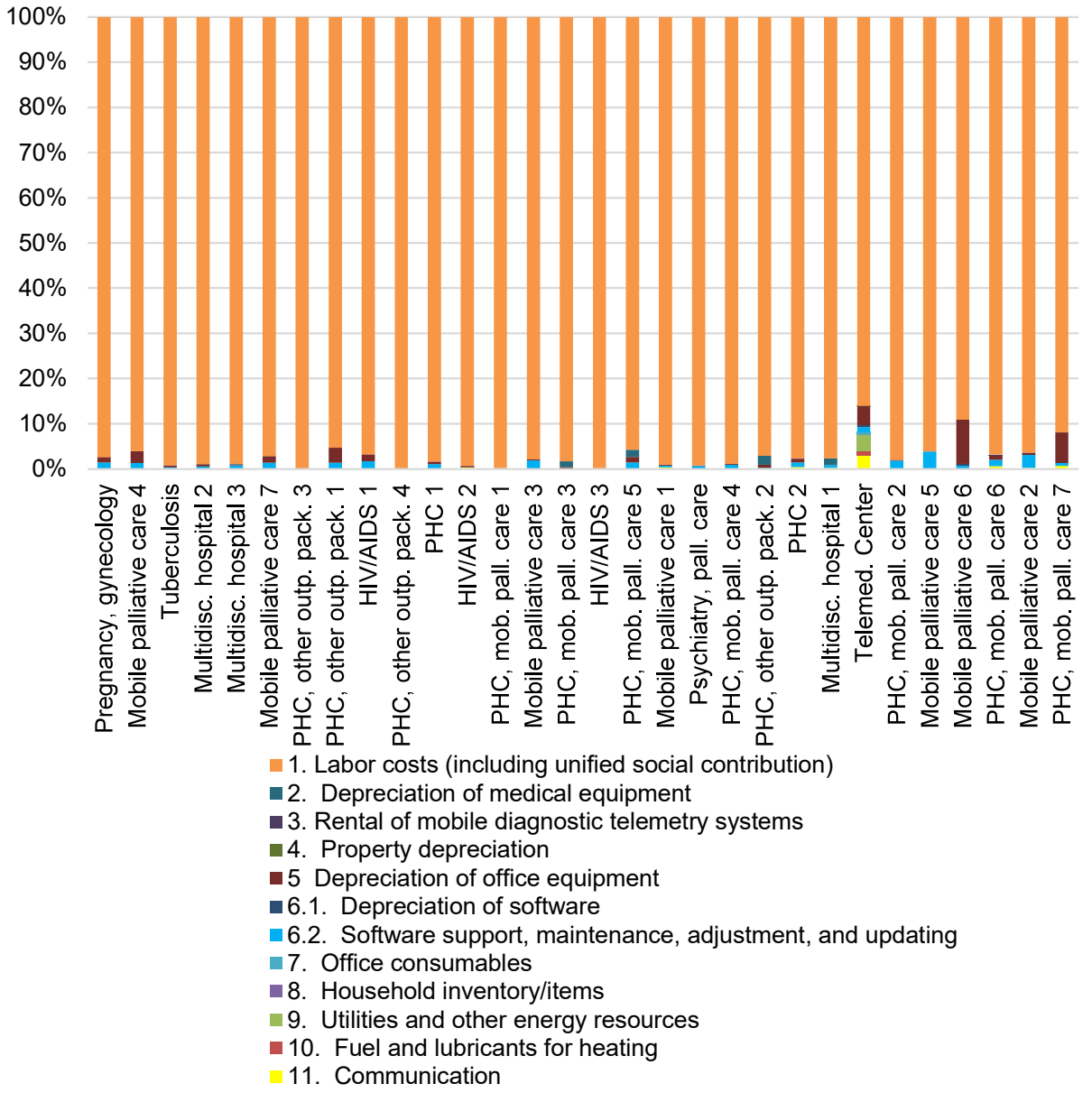
the personnel including the unified social contribution accounted for about 98 percent of the costs in both 2021 and 2022. The costs of the facility also included depreciation of six portable telemedicine systems (IDI 7500 mobile diagnostic complex, DS+ digital dermatoscope) with pre-installed software, which were received in 2019 from the health department of the regional state administration. However, the physicians did not use the systems because they lacked appropriate training.

At the same time, since the employees spent little time performing telemedicine functions (1 percent in 2021, 3.3 percent in 2022), the adjusted costs in 2021 amounted to UAH 127.1 thousand, and in 2022 to UAH 317.9 thousand. In 2021, the facility provided telemedicine services as part of the PHC package, and in 2022, the Mobile Palliative Care package was added. In total, in 2022, the facility conducted 41.4 thousand interactions, of which 8.3 thousand or 20 percent were conducted using telecommunication.

Telemedicine delivery costs by cost items. The structure of total telemedicine delivery costs for 2022 (Figure 4.13) showed that the salary of the personnel in health facilities (N=30), including unified social contribution, accounted for the majority of delivery costs, its share ranging from 86 percent to 100 percent. The next largest cost item was depreciation of medical and non-medical hardware and software (from 0.1 percent to 10.3 percent [N=28]); the share of software maintenance costs ranged from 0.05 percent to 3.9 percent (N=27); the share of communication costs ranged from 0.01 percent to 2.9 percent (N=12).

Other costs (other than those listed above) were incurred by the regional telemedicine center: fuel and heating materials (1 percent of total costs); utilities and other energy costs (3.5 percent); office supplies (0.7 percent); and property depreciation (0.01 percent). One facility (N=1) had household inventory costs (0.1 percent); another facility rented mobile diagnostic telemetry systems (0.2 percent).

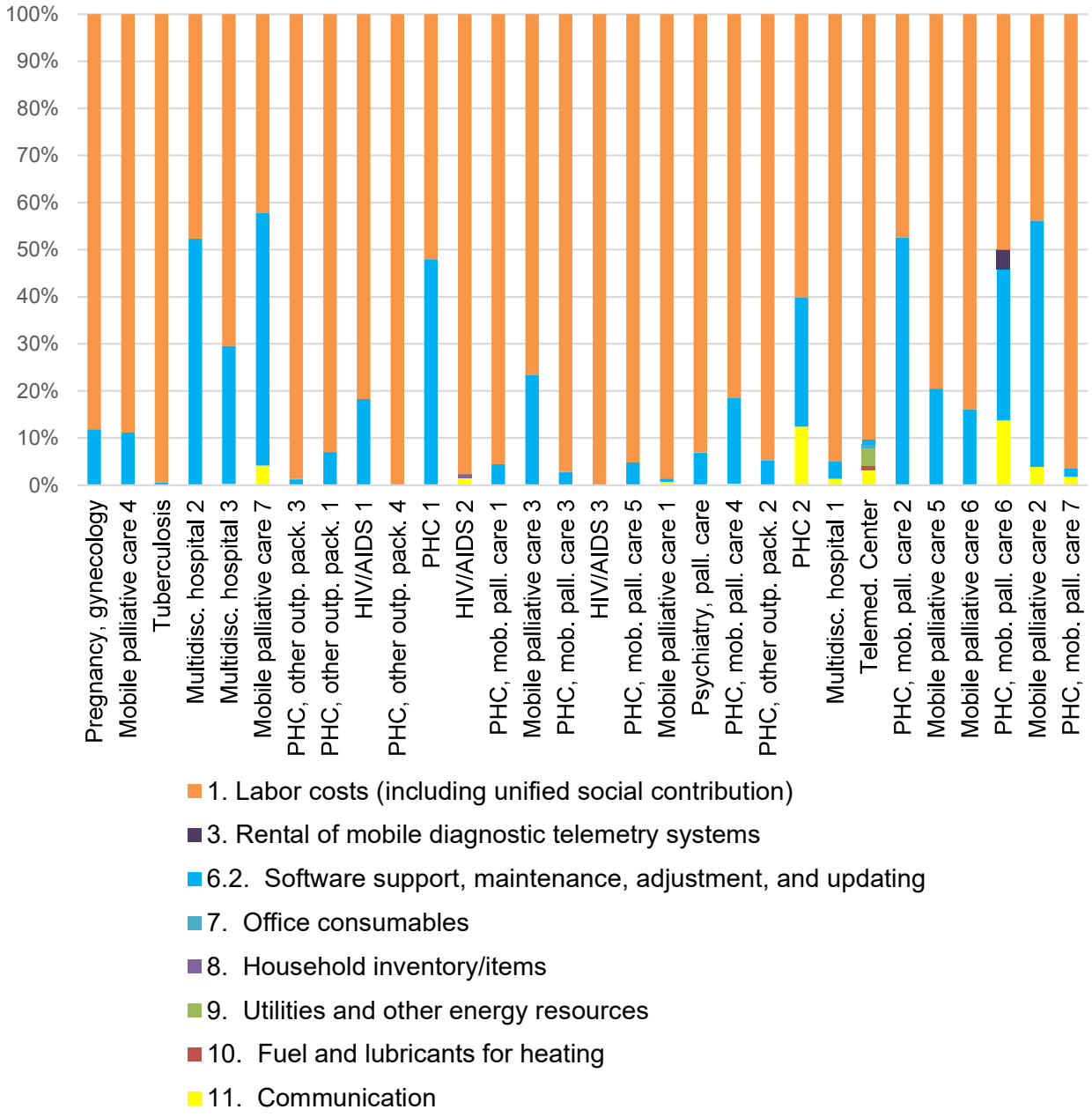
Figure 4.13: Structure of total telemedicine delivery costs at facility level, 2022, %. *Source: facility data*



The structure of **adjusted telemedicine delivery costs** for 2022 (Figure 4.14) shows that in health facilities (N=30) labor costs (including unified social contribution) account for the majority of delivery costs, but in some facilities their share was lower than in the structure of total costs and ranged from 42.1 percent to 100 percent; the next largest was software maintenance costs (their share ranged from 0.6 percent to 53.7 percent, N=27); the share of communication costs ranged from 0.1 percent to 13.8 percent (N=12). Other costs (other than those listed above) were incurred by the regional telemedicine center: fuel and heating materials (1.1 percent of total costs); utilities and other energy costs (3.7 percent), office supplies (0.7 percent). One facility (N=1) had household inventory costs

(0.8 percent of total costs); another facility (N=1) rented mobile diagnostic telemetry systems (4.0 percent of total costs).

Figure 4.14: Structure of adjusted telemedicine delivery costs at facility level, 2022, %. *Source: facility data*



Total and adjusted telemedicine delivery costs of communal facilities are compared in Table 4.7.

Table 4.7: Total and adjusted telemedicine delivery costs of public communal providers by cost items, 2022. *Source: facility data*

Cost item	Total costs, UAH thousand	*Cost structure, %*	Adjusted costs, UAH thousand	*Cost structure, %*
TOTAL	**272,960.8**	***100.00%***	**22,352.4**	***100.00%***
1. Labor costs, including unified social contribution	**268,911.3**	***98.52%***	**20,031.0**	***89.61%***
2. Depreciation of medical devices:	**468.1**	***0.17%***		
2.1. Depreciation of medical diagnostic equipment with data transmission function	154.1	*0.06%*		
2.2. Depreciation of mobile diagnostic and telemetry systems	314.0	*0.12%*		
3. Rental of mobile diagnostic telemetry systems				
4. Property depreciation				
5. Depreciation of office equipment:	**1,260.0**	***0.46%***		
5.1. Office devices:	1,260.0	*0.46%*		
5.1.1. PCs	875.3	*0.32%*		
5.1.2. Multimedia devices	38.1	*0.01%*		
5.1.3. Printers	165.1	*0.06%*		
5.1.4. Networking hardware	2.8	*0.00%*		
5.1.5. Uninterruptible power supplies	8.7	*0.00%*		
5.1.6. Office furniture	169.5	*0.06%*		
5.1.7. Other	0.6	*0.00%*		
5.2. IT infrastructure, server				
5.3. Call center equipment				
6. Software:	**2,182.2**	***0.80%***	**2,182.2**	***9.76%***
6.1. Depreciation:				
6.1.1. Website				
6.1.2. MIC license				
6.1.4. Other PC software license				
6.2. Software support, maintenance, adjustment, and updating:	2,182.2	*0.80%*	2,182.2	*9.76%*
6.2.2. MIS	2,148.5	*0.79%*	2,148.5	*9.61%*
6.2.3. Telemedicine software	33.7	*0.01%*	33.7	*0.15%*
7. Office consumables				
8. Household inventory/items	**5.6**	***0.00%***	**5.6**	***0.03%***
9. Utilities and other energy resources				
10. Fuel and lubricants for heating (pellets, firewood, coal, and other)				
11. Communication (phone number rental, subscription fee, Internet, backup channel (traffic, dedicated IP), website (domain, hosting), and other.	**133.6**	***0.05%***	**133.6**	***0.60%***

In 2022, 10 out of 23 public communal providers had **medical equipment with data transmission functions** (the equipment was received in 2022, 2021 and earlier). Four facilities used it for its intended purpose in full, three used it without the data transmission function, and three did not use it at all (see Table 4.8).

Table 4.8: Availability and use of medical equipment with data transmission function in health facilities, 2022. *Source: facility data*

No.	Conventional name of facility	Name of medical equipment	Year of capitalization / cost / source of funding*	Asset utilization
1.	Public communal PHC 2	1. Electrocardiographs with data transmission function—7 units	Capitalized before 2021 / PMG	Utilized
2.	Public communal Multidisciplinary hospital 3	1. TREDEX/Telecard system (ECG transmission software) 2. Central station for receiving remotely transmitted ECG data (PC)—1 unit 3. UCARD 100 electrocardiograph with a telemedicine module —1 unit	Capitalized before 2021 / Charitable aid and other sources	Utilized
3.	Public communal Multidisciplinary hospital 1	1. Mammograph with telemedicine function (uses special software to store and transmit images to oncology center)—1 unit 2. X-ray machine (transmits data to special software within the facility)—1 unit	Capitalized before 2021 / PMG and other budgets	Utilized
4.	Public communal PHC 1	1. Portable telecommunication diagnostic systems—2 units	2021 / UAH 220 thousand / PMG	Utilized in complicated cases (to send patient data to a narrow specialist of the polyclinic)
5.	Private facility PHC, mobile palliative care 6	1. Mobile telemetry kits (ECG, spirometer, stethoscope, pulse oximeter, blood pressure monitor, thermometer, camera, glucometer, dermatoscope, and other)—2 units	Capitalized before 2021 / PMG	Rented, operated without data transmission
6.	Public communal PHC, mobile palliative care 5	1. Mobile diagnostic complexes—6 units	2021 / UAH 652.0 thousand / owner	Operated without data transmission
7.	Public communal PHC, other outpatient packages 2	1. Mobile diagnostic complexes—3 units	2021 / UAH 308.7 thousand / other budgets	Operated without data transmission as there was no appropriate training
		2. ECG with data transmission function	Capitalized before 2021 / Owner	
8.	Public communal Multidisciplinary hospital 2	1. Teladoc software and hardware complex (virtual presence of a physician by the patient's side)— 1 unit	Late 2022 / UAH 58 thousand / Charitable aid	Operated without data transmission, used for visual examination of the patient
9.	Public communal Management of pregnancy, gynecology	1. CTG Sigmafon System, telemedicine systems for pregnant women—2 units	2022 / UAH 2 / Charitable aid	Not utilized as there is no software

No.	Conventional name of facility	Name of medical equipment	Year of capitalization / cost / source of funding*	Asset utilization
10.	Public communal PHC, other outpatient packages 3	1. Telemedicine equipment kits (spirometer, pulse oximeter with a digital camera, patient monitor, electrocardiograph with a data transmission device, dermatoscope with a tablet for family medicine outpatient clinics)—4 units	2021 / UAH 107 thousand / other budgets (regional council)	Not utilized because the equipment is not configured for data transmission
11.	Public communal PHC, mobile palliative care 3	1. Portable telemedicine complexes (IDI 7500 mobile diagnostic complex, DS+ digital dermatoscope) with pre-installed software—6 units	Received in 2019 from the Department of Health of the Regional State Administration / Other budgets	Not utilized as there was no physician training

Software for data transmission and storage was available at one facility (city multidisciplinary hospital), where two programs were used for telemedicine. The mammography software, received as charitable aid, allows importing images between facilities and, in case of pathologies, referring them to the oncology center. The cost of software maintenance in 2022 amounted to UAH 3.2 thousand. The PACS24 software (cloud data storage) and the software for X-ray machine with computer hardware allow viewing X-rays on any computer within the facility. Also, with a QR (Quick Response) code, the images can be viewed in another facility that has purchased this software under PMG. In 2022, the facility spent UAH 30.5 thousand on software maintenance.

Eight public communal providers had **communication costs**. In one of the facilities, these costs were allocated to cardiograph telecommunications, which amounted to UAH 100 per month and were covered by PMG under a contract with a mobile operator. In other facilities, this cost item mainly covered telephone communication services, which were incurred when the personnel involved in the delivery of telemedicine services used facility-owned phones.

None of the public communal providers had a **telemedicine call center**.

The telemedicine delivery costs of the regional telemedicine center are somewhat different from other facilities (in particular, the call center equipment costs). Their amounts and structure are shown in Table 4.9.

Table 4.9: Telemedicine delivery costs of the regional telemedicine center by cost items, 2022. ***Source: facility data***

Cost item	Total costs, UAH thousand	*Cost structure, %*	Adjusted costs, UAH thousand	*Cost structure, %*
TOTAL	**4,444.8**	***100.00%***	**4,235.4**	***100.00%***
1. Labor costs, unified social contribution included	**3,824.5**	***86.04%***	**3,824.5**	***90.30%***
2. Depreciation of medical devices				
3. Rental of mobile diagnostic telemetry systems				
4. Property depreciation	**0.3**	***0.01%***		

Cost item	Total costs, UAH thousand	*Cost structure, %*	Adjusted costs, UAH thousand	*Cost structure, %*
5. Depreciation of office equipment:	**188.7**	***4.25%***		
5.2. IT infrastructure, server	153.3	*3.45%*		
5.3. Call center equipment:	35.4	*0.80%*		
5.3.1. PCs	2.5	*0.06%*		
5.3.2. Multimedia devices	0.6	*0.01%*		
5.3.3. Printers	0.2	*0.005%*		
5.3.4. Networking hardware	0.3	*0.01%*		
5.3.5. Uninterruptible power supplies	29.4	*0.66%*		
5.3.6. Office furniture	2.4	*0.05%*		
6. Software:	**67.4**	***1.52%***	**47.0**	***1.11%***
6.1. Depreciation	20.4	*0.46%*		
6.1.1. Website				
6.1.2. MIC license				
6.1.4. Other PC software license*	20.4	*0.46%*		
6.2. Software support, maintenance, adjustment, and updating	47.0	*1.06%*	47.0	*1.11%*
6.2.2. MIS**	27.0	*0.61%*	27.0	*0.64%*
6.2.3. Telemedicine software***	20.0	*0.45%*	20.0	*0.47%*
7. Office consumables	**30.2**	***0.68%***	**30.2**	***0.71%***
8. Household inventory/items	**0.0**	***0.00%***	**0.0**	***0.00%***
9. Utilities and other energy resources	**157.7**	***3.55%***	**157.7**	***3.72%***
10. Fuel and lubricants for heating (pellets, firewood, coal, and other)	**44.9**	***1.01%***	**44.9**	***1.06%***
11. Communication (phone number rental, subscription fee, Internet, backup channel (traffic, dedicated IP), website (domain, hosting), and other	**131.0**	***2.95%***	**131.0**	***3.09%***

* Depreciation of other PC software license refers to Windows license depreciation.

** MIS maintenance costs refer to the maintenance of the Medinet telemedicine MIS, which operates separately from the facility MIS and ensures patient data exchange (including files, X-rays, diagnostic tests, and other) between physicians.

*** Telemedicine software maintenance costs refer to the maintenance of Webex software, which is used to organize conference calls with physicians from all over the region.

Private facility costs. The total and adjusted telemedicine delivery costs of private facilities are compared in Table 4.10.

Table 4.10: Total and adjusted telemedicine delivery costs of private facilities by cost items, 2022. *Source: facility data*

Cost item	Total costs, UAH thousand	*Cost structure, %*	Adjusted costs, UAH thousand	*Cost structure, %*
TOTAL	**6,249.6**	***100.00%***	**663.6**	***100.00%***
1. Labor costs, including unified social contribution	**5,922.5**	***94.77%***	**536.5**	***80.85%***
2. Depreciation of medical devices				
3. Rental of mobile diagnostic telemetry systems	**2.0**	***0.03%***	**2.0**	***0.30%***
4. Property depreciation				

Cost item	Total costs, UAH thousand	*Cost structure, %*	Adjusted costs, UAH thousand	*Cost structure, %*
5. Depreciation of office equipment:	**195.5**	***3.13%***		
5.1. Office devices:	195.5	*3.13%*		
5.1.1. PCs	165.6	*2.65%*		
5.1.2. Multimedia devices	3.4	*0.05%*		
5.1.3. Printer	7.5	*0.12%*		
5.1.4. Networking hardware	1.6	*0.03%*		
5.1.5. Uninterruptible power supplies	3.8	*0.06%*		
5.1.6. Office furniture	13.5	*0.22%*		
6. Software:	**112.1**	***1.79%***	**107.6**	***16.21%***
6.1. Depreciation	4.5	*0.07%*		
6.1.1. Website				
6.1.2. MIC license	4.5	*0.07%*		
6.2. Software support, maintenance, adjustment, and updating	107.6	*1.72%*	107.6	*16.21%*
6.2.2. MIS	107.6	*1.72%*	107.6	*16.21*
7. Office consumables				
8. Household inventory/items				
9. Utilities and other energy resources				
10. Fuel and lubricants for heating (pellets, firewood, coal, and other)				
11. Communication (phone number rental, subscription fee, Internet, backup channel (traffic, dedicated IP), website (domain, hosting), and other	**17.5**	***0.28%***	**17.5**	***2.64%***

Only one of the six private facilities (PHC, mobile palliative care 6) had two **mobile telemetry kits** (ECG, spirometer, stethoscope, pulse oximeter, tonometer, thermometer, examination camera, glucometer, dermatoscope, sand other). The facility rented it for UAH 2 thousand per year and used without data transmission, as they did not think it was necessary.

One facility had a **depreciating** license for the software and database of the MedInfoService MIS, version for polyclinics and inpatient departments.

Three facilities reported **communication costs**, which included monthly fees for office phones and Internet fees. Other facilities did not incur such costs because their employees used their own phones for telemedicine services, and the facilities did not reimburse these costs. At the same time, it should be considered that with the development of telemedicine technologies, there will be mandatory communication costs, especially if the number of consultations and data transfer volumes increase.

Telemedicine delivery costs by revenue source. The breakdown of telemedicine delivery costs at facility level by revenue sources is shown in Table 4.11.

Table 4.11: Telemedicine delivery costs by the type of provider and revenue sources. ***Source: facility data***

Type of provider	No. of facilities	Telemedicine delivery costs, UAH thousand	Including by revenue source				
			PMG	Owner	Other budgets	Charitable aid	Other sources*
2022, total	**30**	**283,655.2**	**282,351.6**	**447.3**	**695.7**	**52.8**	**107.8**
Structure, %		*100.0%*	*99.5%*	*0.2%*	*0.2%*	*0.02%*	*0.04%*
Public Communal	23	272,960.8	272,176.2	443.4	283.1	52.8	5.3
Structure, %		*100.0%*	*99.7%*	*0.2%*	*0.1%*	*0.0%*	*0.0%*
Public Communal (RTC)	1	4,444.8	4,031.9	0.3	412.6	0.0	0.0
Structure, %		*100.0%*	*90.7%*	*0.0*	*9.3%*	*0.0*	*0.0*
Private	6	6,249.6	6,143.5	3.6	0.0	0.0	102.5
Structure, %		*100.0%*	*98.3%*	*0.1%*	*0.0%*	*0.0%*	*1.6%*
2021, total	**23**	**151,754.4**	**150,041.2**	**257.0**	**1,264.4**	**183.0**	**8.8**
Structure, %		*100.0%*	*98.9%*	*0.2%*	*0.8%*	*0.1%*	*0.01%*
Public Communal	20	146,920.5	146,336.9	208.1	183.7	183.0	8.8
Structure, %		*100.0%*	*99.6%*	*0.1%*	*0.1%*	*0.1%*	*0.0%*
Public Communal (RTC)	1	4,440.1	3,359.1	0.3	1,080.7	0.0	0.0
Structure, %		*100.0%*	*75.7%*	*0.0%*	*24.3%*	*0.0%*	*0.0%*
Private	2	393.8	345.2	48.6	0.0	0.0	0.0
Structure, %		*100.0%*	*87.7%*	*12.3%*	*0.0%*	*0.0%*	*0.0%*
2020 Public Communal (RTC)	**1**	**4,126.8**	**3,632.6**	**0.0**	**494.2**	**0.0**	**0.0**
Structure, %		*100.0%*	*88.0%*	*0.0%*	*12.0%*	*0.0%*	*0.0%*
2019 Public Communal (RTC)	**1**	**2,517.4**	**2,111.1**	**180.4**	**225.8**	**0.0**	**0.0**
Structure, %		*100.0%*	*83.9%*	*7.2%*	*9.0%*	*0.0%*	*0.0%*

* Other sources of financing: providing paid medical and non-medical services to individuals and legal entities, receiving of insurance payments, property lease, utility payments compensated by the tenant, deposit interest, proceeds from the sale of scrap metal, refunds of court claims, reimbursement of business trips, and other.

In 2022, eight public communal facilities (N=23) had costs covered by charitable aid, while private facilities (N=6) did not have such costs. Eleven facilities had costs covered by revenue received from the owner. These facilities included one private provider and one regional telemedicine center (property depreciation); six public communal facilities had costs covered by other budgets. Two facilities, one of them private, had costs covered by revenue from other sources.

4.2.3. A checklist of telemedicine delivery costs at facility level

The information about 2022 telemedicine delivery costs provided by facilities was correlated with the checklist of cost items from the international review *Cost Analysis of Telemedicine Implementation in the Lens of Healthcare Sustainability: A Review of the Literature*[10] (see **Section 2.1**).

Analysis showed (see Table 4.12) that in 2022, some costs that could have been incurred based on international experience were missing. In particular, the facilities did not report on the following cost items:

[10] Hereinafter, this list is referred to as the cost checklist.

- Remodeling
- Launching certain telemedicine processes
- Personnel training, both initial and ongoing (although there were cases of free training)
- Patient education and support
- Waste disposal (medical)
- Telemedicine equipment maintenance
- External telemedicine services. However, physicians of some facilities might consult physicians of other facilities free of charge, but such doctor-to-doctor interactions are not recorded (except for the regional telemedicine center). For example, physicians from one multidisciplinary hospital receive free consultations from oncology center specialists under the mammography package.
- Renting a cloud for diagnostic data storage. Facilities incurred other costs related to data storage. For example, one multidisciplinary hospital spent UAH 30.5 thousand on the maintenance of PACS24 software, which is a digital archive for X-rays and MRI images. In another hospital, digital electrocardiograms of small size are stored in the Tredex Telecard system. This software is maintained by software engineers of the analytics department of the facility, and the only cost item is *Depreciation*. In 2020, the regional telemedicine center received server equipment (two servers and software) with the maintenance cost amounting to UAH 184.5 thousand for three years, i.e., UAH 61.5 thousand per year. Other facilities had no data to store on servers or in digital archives.

Also, in 2021–2022, facilities did not receive such assets as personal remote health monitoring devices (smartwatches, bracelets, holter monitors, heart rate monitors, biometric sensors integrated into wheelchairs, or other IoMT devices). The facilities did not capitalize telemedicine software or IT infrastructure (servers, server software, complex information security system license).

Table 4.12: Breakdown of telemedicine delivery costs at facility level in correlation with the cost checklist, 2022, *UAH*

Introduction	Capitalization, UAH	Delivery	Costs, UAH
Investment costs	**2,082,335**	**Operating and service costs**	**283,655,238**
Hardware:	**1,880,314**	**Personnel:**	**278,658,381**
• Medical devices	58,002	• Physicians	238,336,144
• Office devices:	1,822,312	• Nurses	31,260,447
- PC	1,045,443	• Technical	151,973
- Printer	276,394	• IT	2,728,657
- Office furniture	418,743	• Call center / Telemedicine center	1,893,963
- Other		• Administrative	1,485,549
Software:	**30,000**	**Staff education:**	**0**
• License	30,000	• Continuous training	
		• Upgrade training	
IT infrastructure:	**5,590**	**Service hardware:**	**470,054**
• Server		• Depreciation of medical devices	468,054
• Internet		• Rental of medical devices	2,000
• Utility lines	**5,590**		

Introduction	Capitalization, UAH	Delivery	Costs, UAH
• Privacy security			
Call center equipment:	**166,431**	**Organization hardware:**	**1,644,546**
• Office devices:		• Depreciation:	1,644,230
- PC		- Office devices	1,455,505
- Printer		- IT infrastructure	153,316
- Office furniture		- Call center equipment	35,409
		- Space	316
Construction and remodeling of office space:	**0**	**Software:**	**2,361,699**
• Office restorations		• Depreciation:	24,894
• New building constructions	**0**	- License	24,894
Setup costs:		**Patient support:**	**0**
• Business processes		• Enrollment	
• Privacy security		• Training	
		• Consulting	
Personnel:	**0**	**Direct material:**	**35,830**
• Temporary hiring		• Medical consumables	0
• Training (basic skills, new work processes, and other)		• Office consumables	35,830
		Utilities:	**484,729**
		• Electricity	
		• Gas	
		• Communication costs	282,109
		• Water	
		Waste disposal (medical)	**0**

4.2.4. Personnel analysis

To estimate the number of personnel required to deliver telemedicine services to the extent recorded in eHealth, the study team analyzed the data on the average number of employees and their number of FTE.

- In public communal facilities (N=23), **about 10 percent of the total number of employees** (858 out of 8,410), 38 percent of physicians (699 out of 1,831), and 4 percent of nurses (138 out of 3,121) **were involved in the delivery of doctor-to-patient telemedicine services** in 2022.
- In the regional telemedicine center, 4 percent of all the employees of the regional multidisciplinary hospital (98 out of 2,431) and 15.5 percent of physicians (73 out of 472) were involved in the delivery of doctor-to-doctor telemedicine services in 2022.
- Employees of PHC facilities were the most involved in telemedicine services. In 2022, almost one-third of all employees (405 out of 1297) provided consultations remotely (to varying degrees). However, such services represented only 3 percent of their time on average.
- In FTE terms, only 6 percent employees in 2021 and 7 percent employees in 2022 would be required to perform telemedicine-related functions if they worked full time.

- In all the facilities, in 2021 and 2022, telemedicine services were mainly provided by physicians (about 80 percent), the share of nurses was 15 percent, and that of technical and other staff was 5 percent.
- Psychologists providing palliative and mental health care for patients and their family members spent 37 percent of their working time on average on teleconsultations (this varied from 5 percent to 83 percent between facilities).
- In 2022, technical support at the regional telemedicine center was provided by eight full-time engineers and technicians, 17 computer operators, and a dispatch service. Only one other public communal facility had one engineer with telemedicine functions and six public communal facilities had one system administrator (software engineer) each. Private facilities did not involve any technical staff in telemedicine delivery.

This section analyzes the number of personnel delivering telemedicine services in the participating facilities. The situation is outlined in Table 4.13.

Table 4.13: Average and estimated number of employees involved in telemedicine in health facilities of different types, 2022. ***Source: facility data***

Type of provider	Number of employees involved in telemedicine, persons			Estimated number of employees in FTE required exclusively for telemedicine delivery, persons		
	average number	estimated number in FTE	*% of average number (column 3 to column 2)*	total	*% of average number (column 5 to column 2)*	*% of estimated number (column 5 to column 3)*
1	**2**	**3**	**4**	**5**	**6**	**7**
Communal	858	711.6	*82.9%*	49.8	*5.8%*	*7.0%*
Communal (RTC)	98	16.4	*16.7%*	16.4	*16.7%*	*100.0%*
Private	26	18.2	*70.1%*	2.4	*9.3%*	*13.2%*
Total	**982**	**746.2**	***76.0%***	**68.7**	***7.0%***	***9.2%***

In total, 982 employees of 30 health facilities delivered telemedicine services or performed telemedicine-related functions in 2022, including 858 employees in public communal facilities, 98 in regional telemedicine center, and 26 in private facility.

In FTE terms (column 6 of Table 4.13), an average of 7 percent employees would be required to perform telemedicine-related functions if they worked full time during a year (68.7 FTE / 982 employees), including 6 percent in public communal facilities (49.8 / 858), 16.7 percent in the regional telemedicine center (16.4 / 98), and 9.3 percent in private facilities (2.4 / 26).

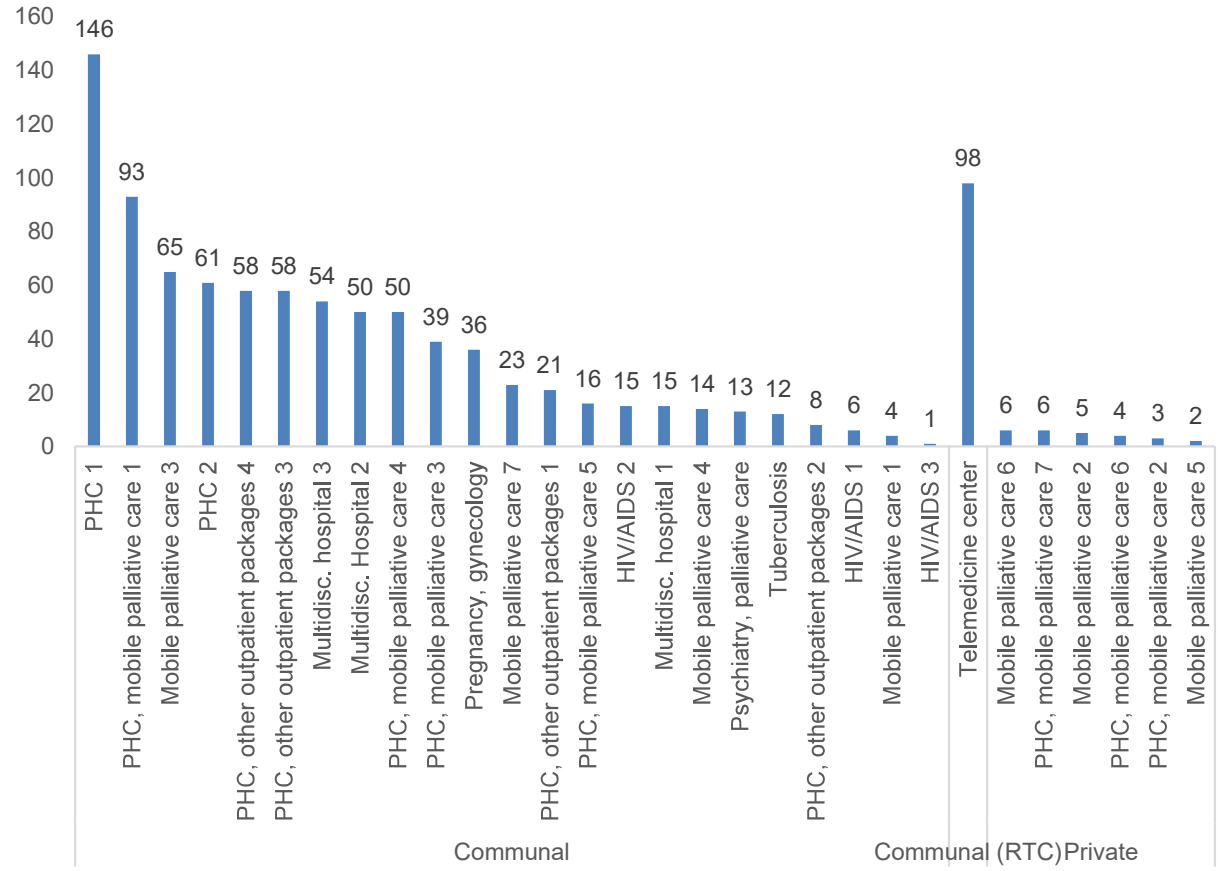
In general, employees of all facilities (982 persons) spent an average of 9.2 percent of their working time performing telemedicine-related functions (column 7 of the table), in

particular: 7 percent in public communal,[11] 100 percent in the telemedicine center,[12] and 13.2 percent in private facilities.[13]

The proportion of working time utilization varied significantly among facilities. In 2021, it ranged from 0.3 percent (in a clinical emergency hospital) to 50 percent (in a medical center for combatant rehabilitation), and in 2022, it ranged from 0.5 percent (in a clinical emergency hospital) to 67.8 percent (in a regional tuberculosis dispensary).

The highest number of telemedicine workers (146 employees) was reported by one PHC center, and the lowest (one employee) by a municipal consultative diagnostic clinic, where one infectious disease specialist provided telemedicine services only within the HIV package, spending almost 60 percent of working time on these services (Figure 4.15).

Figure 4.15: Number of employees involved in telemedicine in the participating facilities, 2022. *Source: facility data*



[11] Calculation: 49.8 *(employees in FTE, column 5)* x 100 / 711.6 *(employees involved in telemedicine in FTE, column 2)* = 7.0 precent.

[12] This is an estimated value based on the assumption that all 73 physicians worked standard hours: 0.5 *(employees in FTE)* x 100 / 73 *(number of physicians)* = 0.7 percent.

[13] Calculation: 2.4 *(employees in FTE)* x 100 / 18.2 *(employees involved in telemedicine in FTE)* = 13.2 percent.

The estimated number of employees in FTE was 746.2, which is 76 percent of the total number of personnel involved in telemedicine. This indicates that in 2022, some employees worked part time for various reasons. Employees of different facilities spent different amounts of their working time on telemedicine, ranging from 30 percent to 100 percent on average.

In public communal facilities, the number of personnel involved in telemedicine in FTE was 711.6 persons (approximately 83 percent of their total average number), with 16.4 persons in the regional telemedicine center (16.7 percent of the total average number) and 18.2 persons in private facilities (approximately 70 percent of their total average number).

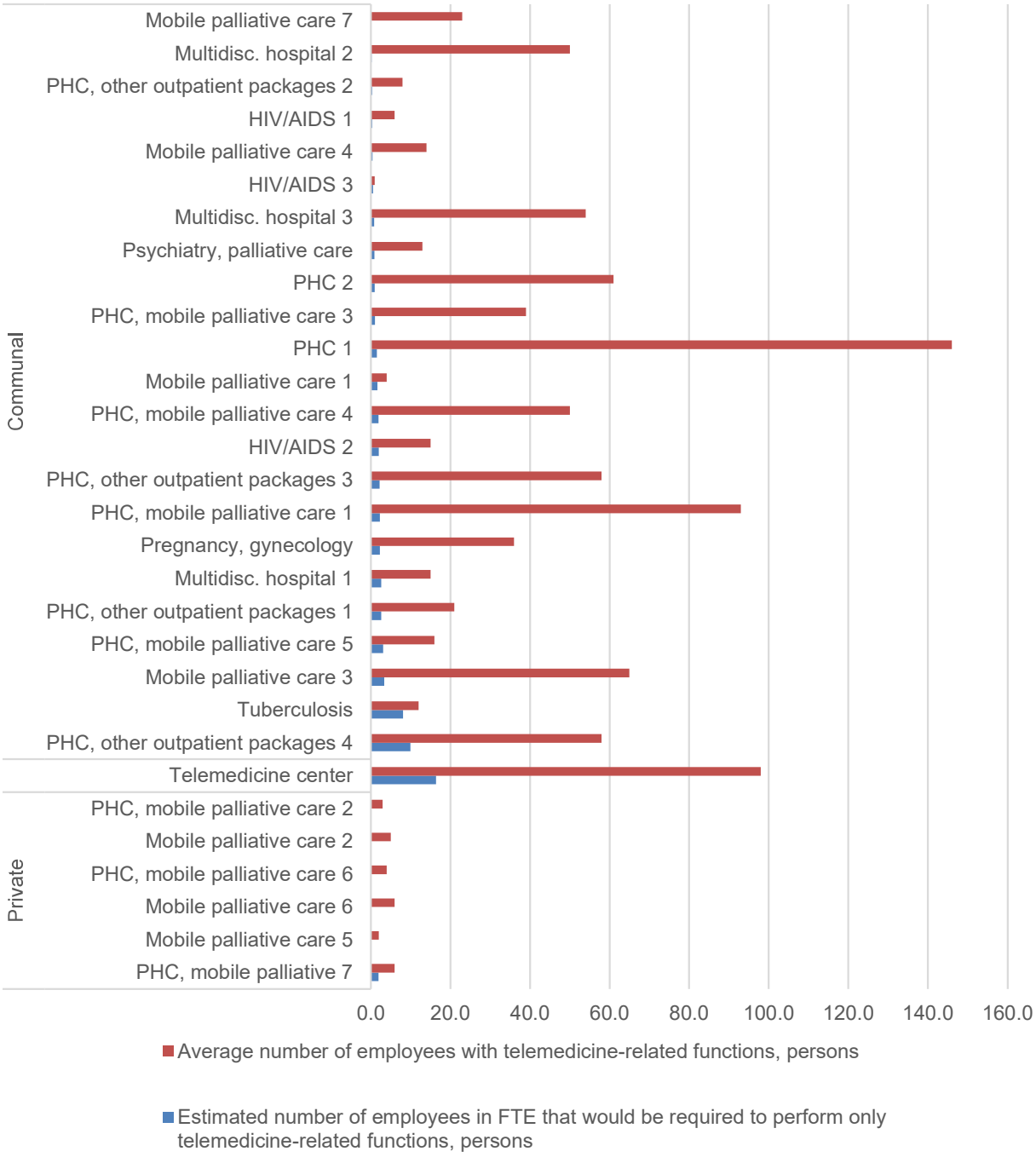
It should be noted that the study analyzed the telemedicine center (which is one department), not the whole facility. The center has special personnel, which includes a dispatch service (call center) with engineers, technicians and an IT support department with computer operators. In 2022, these positions were held by 25 employees (15.9 FTE). Also, using the functionality of the telemedicine center, 73 physicians provided about 4 thousand teleconsultations, which were covered by the revenue of the facility. Their number in FTE (0.5) was calculated based on the time of doctor-to-doctor service delivery,[14] not the total time for which salaries were accrued as in other facilities.

The total number of telemedicine center employees was 98, or 16.4 in FTE (15.9 telemedicine center employees + 0.5 physicians), which is exactly the number of employees that would be required to perform the workload in 2022 if they worked full time. For more details on telemedicine center organization, see **Section 4.2.6**.

The estimated number of employees in FTE that would be required to perform functions related exclusively to telemedicine was 68.7 employees in total, including 49.8 employees in public communal facilities, 16.4 employees in the regional telemedicine center, and 2.4 employees in private facilities. This number ranged from 0.1 to 10 employees in different facilities (Figure 4.16). A municipal clinic providing services under PHC and other packages would require 10 employees or 17 percent of those involved in telemedicine.

[14] Calculation: 3,915 services x 15 minutes *(average service duration)* / 60 minutes = 979 man-hours; 979 / 1978.9 hours *(standard working hours for a physician)* = 0.5 *FTE*.

Figure 4.16: Estimated number of employees in FTE that would be required to perform only telemedicine-related functions compared to the average number of personnel involved in telemedicine, 2022. *Source: facility data*



The proportion of employees in FTE that would be required to perform only telemedicine-related functions in total personnel involved in telemedicine varied significantly among facilities from 0.5 percent (0.3 persons in FTE out of 50 involved) in a clinical emergency hospital to 67, 8 percent (8.1 employees in FTE out of 12 involved) in a regional TB dispensary, where online consultations are provided by both physicians (6 persons, 4.1 FTE), and nurses (6 persons, 4 FTE). In 2022, the facility delivered 44 percent of its

services online (30.1 thousand out of 68.0 thousand). Employees provided teleconsultations and informed patients: they interpreted test results; provided information about diseases, medications, treatment, side effects, and hospitalization; encouraged patients to get treatment or visit a doctor offline and take tests; helped them figure out the time of treatment; and provided distance learning for patients and their relatives. The radiologist also received X-rays and CT scans via email and messengers for description and consultation.

The number of online consultations provided usually directly affects the estimated number of employees in FTE that would be required to perform telemedicine functions. For example, in the emergency hospital, which is a multidisciplinary facility with inpatient and outpatient departments located in different parts of the city among residential areas, patients prefer to communicate with their doctor in person. Hence, this facility had the lowest proportion of telemedicine services provided (0.4 percent of the total number of services provided or 1.9 thousand out of 444.7 thousand) and the lowest proportion of the average number of employees in FTE (0.5 percent or 0.3 persons in FTE out of 50) compared to other analyzed facilities.

Indicators of personnel involvement in telemedicine (amount of time, number/proportion of employees by the type of provider and type of care). Given the lack of data on the total number of employees in private facilities (see **Section 2.2** for more details on these and other limitations of the study), this report analyzes the involvement of communal facility personnel in telemedicine (Table 4.14).

Table 4.14: Analysis of personnel involved in telemedicine by the type of provider, type of facility, and type of care, 2022. *Source: facility data*[15]

No.	Type of facility / type of care	No. of facilities	Average No. of employees, persons (total No. acc. to Form 8 of the 1-HC report)	Average No. of employees involved in telemedicine, persons					
				total	*in % to column 4*	estimated in FTE, total	estimated in FTE concerning telemedicine functions		
							total	*in % to column 5*	*in % to column 7*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1.	**Public Communal**	**23**	**8,410**	**858**	***10.2%***	**711.6**	**49.8**	***5.8%***	***7.0%***
1.1.	Multidisciplinary hospital	3	2,360	119	*5.0%*	107.0	3.7	*3.1%*	*3.5%*
1.2.	Management of pregnancy, gynecology (maternity hospital)	1	270	36	*13.3%*	20.6	2.3	*6.4%*	*11.3%*

[15] To determine the time during which personnel delivered telemedicine services or ensured their delivery, it was necessary to determine the functions of the employees associated with telemedicine and the time spent to perform such functions. One facility was unable to determine this time, so it was assumed that nurses spend the same amount of time per service as physicians (most other providers share this assumption). Since this facility provided only one percent of telemedicine services out of the total number of services, the assumption concerning the time spent per service by nurses had almost no impact on the total number of employees in FTE (0.4 employees in FTE or 0.8 percent of total employees in FTE).

No.	Type of facility / type of care	No. of facilities	Average No. of employees, persons (total No. acc. to Form 8 of the 1-HC report)	Average No. of employees involved in telemedicine, persons					
				total	*in % to column 4*	estimated in FTE, total	estimated in FTE concerning telemedicine functions		
							total	*in % to column 5*	*in % to column 7*
1.3.	Psychiatric and palliative care (regional institution for psychiatric care)	1	712	13	*1.8%*	9.6	0.9	*6.8%*	*9.3%*
1.4.	HIV (specialized centers, polyclinic)	3	471	22	*4.7%*	17.3	3.0	*13.6%*	*17.4%*
1.5.	Tuberculosis (regional tuberculosis dispensary)	1	341	12	*3.5%*	12.0	8.1	*67.8%*	*67.8%*
1.6.	Mobile palliative care (children's and district hospitals, rehabilitation center for combatants, polyclinic association)	4	1,254	106	*8.5%*	76.6	5.7	*5.4%*	*7.5%*
1.7.	PHC and other outpatient packages (hospitals, clinics)	4	1,705	145	*8.5%*	118.8	15.1	*10.4%*	*12.7%*
1.8.	PHC (PHC center and polyclinic)	2	764	207	*27.1%*	172.6	2.5	*1.2%*	*1.5%*
1.9.	PHC and mobile palliative care (PHC center)	4	533	198	*37.1%*	177.1	8.4	*4.2%*	*4.7%*
2.	**Public Communal (RTC)**	**1**	**2,431**	**98**	***4.0%***	**16.4**	**16.4**	***16.7%***	***100.0 %***
2.1.	Regional telemedicine center	1	2,431	98	*4.0%*	16.4	16.4	*16.7%*	*100.0 %*
3.	**Private**	**6**	**x**	**26**	***X***	**18.2**	**2.4**	***9.3%***	***13.2%***
3.1.	PHC and mobile palliative care (LLC)	3	x	13	*X*	11.9	2.1	*16.2%*	*17.7%*
3.2.	Mobile palliative care (LLC, PP)	3	x	13	*X*	6.3	0.3	*2.3%*	*4.7%*
	Total	**30**	**x**	**982**	***X***	**746.2**	**68.7**	***7.0%***	***9.2%***

The table shows that in 2022, the total average number of employees per year (full time, external part time or those working under civil law contracts) in 23 public communal facilities, according to the 1-HC report, was 8,410, of which 858 employees or 10 percent were involved in telemedicine.

The degree of personnel involvement in telemedicine and service delivery time varied significantly among facilities of different types providing different types of care.

Thus, among five PHC facilities and one municipal polyclinic (where 84 percent of telemedicine services were provided under the PHC package), on average almost one-third (31.2 percent) of the total number of employees were involved in telemedicine

services to varying degrees.[16] This is **the highest percentage of employees involved in telemedicine** compared to other types of facilities. At the same time, these facilities spend **the least amount of time** (3 precent) providing telemedicine services compared to other facilities.[17] All the data used to calculate the number of employees in FTE and the proportion of time spent on telemedicine are presented in Table 4.14.

The largest share of telemedicine delivery time (67.8 percent) was spent by the TB dispensary staff,[18] although only 3.5 percent of the employees of this facility are involved in telemedicine services.[19]

In contrast to the public communal facilities with the PHC package, employees of the private facilities with the PHC package spent more time providing teleconsultations— 17.7 percent vs. 3.1 percent on average.

The lowest proportion of personnel (1.8 percent or 13 out of 712) was involved in telemedicine in the regional institution for psychiatric care. At the same time, they spent more than 9 percent of their time consulting online.[20]

The highest proportion of personnel (39 out of 76) was involved in telemedicine in the PHC center of a village council. In 2022, the facility provided PHC and Mobile Palliative Care services. All the physicians of the facility (18 persons) who also worked as physicians of palliative care teams were involved in the delivery of services under both packages. In addition, 20 nurses acted as assistant family physicians, pediatricians, and therapists. The palliative care team also included a clinical psychologist. These employees called patients about vaccinations, issued e-prescriptions according to the doctor's instructions, and other. As a member of the mobile palliative care team, the clinical psychologist consulted patients by phone.

The smallest number of employees (one employee out of 226 or 0.4 percent of the total number of employees, 50 of them being physicians) was involved in telemedicine at the municipal consultative diagnostic clinic. This was an infectious disease specialist, head of the HIV prevention and control department, who provided telemedicine services under the HIV package. However, this facility provided **the largest number of online consultations per specialist—**278 consultations per month on average.

The study shows that private facilities that had PHC and Mobile Palliative Care packages spent 17.7 percent of their time on online consultations on average, while communal facilities with the same packages spent 4.7 percent of their time on these services.

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[16] Calculation: 207 + 198 = 405 *(personnel involved in telemedicine)* x 100 / ((764 + 533) = 1,297 *(average number of all employees in facilities)*) = 31.2 percent.

[17] Calculation: *lines 1.8 and 1.9:* (2.5 + 8.4) = 10.9 *(employees in FTE that would be required to perform telemedicine functions)* x 100 / ((172.6 + 177.1) = 349.7 *(employees involved in telemedicine in FTE)*) = 3.1 percent.

[18] Calculation: *line 1.5:* 8.1 *(employees in FTE that would be required to perform telemedicine functions)* x 100 / 12 *(employees involved in telemedicine in FTE*) = 67.8 percent.

[19] Calculation: *line 1.5:* 12 *(personnel involved in telemedicine)* x 100 / 341 *(average number of all facility employees)* = 3.5 percent.

[20] Calculation: *line 1.3:* 0.9 *(employees in FTE that would be required to perform telemedicine functions)* x 100 / 9.6 *(employees involved in telemedicine in FTE*) = 9.3 percent.

The categories of personnel involved in telemedicine are shown in Table 4.15.

Table 4.15: Analysis of personnel involved in telemedicine by category, 2022. *Source: facility data*

No.	Category of personnel	No. of facilities	Total average number of employees, persons (according to Table 8 of the 1-HC report)	Number of employees involved in telemedicine					
				total	*in % to column 4*	estimated in FTE	estimated in FTE concerning telemedicine functions, persons		
							persons	*in % to column 5*	*in % to column 7*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1.	**Public Communal**	**23**	**8,410**	**858**	***10.2%***	**711.6**	**49.8**	***5.8%***	***7.0%***
1.1.	Physicians		1,831	699	*38.2%*	581.9	39.4	*5.6%*	*6.8%*
1.2.	Nurses		3,121	138	*4.4%*	112.7	7.8	*5.7%*	*6.9%*
1.3.	Technical		X*	1	*X*	0.5	0.01	*1.5%*	*2.9%*
1.4.	IT: technicians, engineers, system administrators, and other		X	6	*X*	5.6	0.6	*9.5%*	*10.3%*
1.5.	Administrative		X	3	*X*	2.7	0.3	*11.2%*	*12.5%*
1.6.	Social worker		X	2	*X*	1.6	0.2	*7.6%*	*9.3%*
1.7.	Psychologist		X	5	*X*	3.6	1.3	*27.0%*	*37.3%*
1.8.	X-ray technician		X	2	*X*	2.0	0.0	*1.4%*	*1.4%*
1.9.	Occupational therapists		X	2	*X*	0.9	0.2	*10.5%*	*23.3%*
2.	**Public Communal (RTC)**	**1**	**2,431**	**98**	***4.0%***	**16.4**	**16.4**	***16.7%***	***100.0%***
2.1.	Physicians		472	73	*15.5%*	0.5	0.5	*0.7%*	*100.0%*
2.2.	Nurses		843	0	*0%*	0.0	0.0		
2.3.	Technical		X	0	*X*	0.0	0.0		
2.4.	IT: technicians, engineers, system administrators, and other		X	8	*X*	5.0	5.0	*62.9%*	*100.0%*
2.5.	Telemedicine center/call center: administrators, dispatchers, PC operators, other employees of the center		X	17	*X*	10.9	10.9	*64.0%*	*100.0%*
2.6.	Administrative		X	0	*X*	0.0	0.0		
3.	**Private**	**6**	**X**	**26**	***X***	**18.2**	**2.4**	***9.3%***	***13.2%***
3.1.	Physicians		X	20	*X*	12.2	0.7	*3.7%*	*6.0%*
3.2.	Nurses		X	4	*X*	4.0	0.7	*17.1%*	*17.1%*
3.3.	Technical		X	0	*X*	0.0	0.0		
3.4.	IT: technicians, engineers, system administrators, and other		X	0	*X*	0.0	0.0		
3.5.	Administrative		X	2	*X*	2.0	1.0	*49.5%*	*50.0%*
	Total	**30**	**X**	**982**	***X***	**746.2**	**68.65**	***7.0%***	***9.2%***

* Data unavailable because Table 8 of the 1-HC report does not analyze employees by these categories.

The table shows that in 23 public communal facilities, out of the total number of employees telemedicine was used by:

- Thirty-eight percent or 699 of physicians, who spent 6.8 percent of their paid time on these services on average,
- Just over four percent (4.4 percent) or 138 of nurses, who spent almost 7 percent of their paid time on these services on average (just like physicians),
- Just under one percent (0.6 percent) or 22 of other employees, who, depending on their category, spent from 1.4 percent to 37.3 percent of their paid time on these services.

In the **regional telemedicine center**, 73 physicians provided doctor-to-doctor consultations, which is 15 percent of their total average number (73 out of 472). The call center personnel involved in telemedicine included 74.5 percent physicians (73), 8.1 percent technicians and engineers (8), and 17.4 percent other employees (administrators, dispatchers; 17 persons in total).

As for telemedicine delivery, the largest share was made up of **physicians**, who accounted for 80.7 percent of all the personnel involved in telemedicine[21] (they spent 6 percent of their working time on average delivering telemedicine services), including 81.5 percent in public communal facilities (6.8 percent of working time spent), 74.5 percent in the regional telemedicine center (0.7 percent of working time spent in the doctor-to-doctor format), and 77 percent in private facilities (6 percent of working time spent).

Nurses provided telemedicine services in 11 facilities (including two private ones) and accounted for 14.5 percent of all the personnel involved in telemedicine (7 percent of their working time spent on telemedicine on average), including 16 percent in public communal facilities (7 percent of working time) and 15 percent in private facilities (17 percent of working time, or almost three times more than physicians with 6 percent).

Among the nurses involved in telemedicine, the facilities reported a functional diagnostics nurse, a mobile palliative care nurse, a PHC nurse, antenatal care nurses and midwives, and other. Their functions included calling patients about vaccinations, creating e-prescriptions according to the physician's instructions, asking the patient about their condition, advising on the treatment of pressure ulcers and wounds and proper oral nutrition, and other.

One facility (a public communal facility) had a telemedicine **engineer** who improved the quality of telemedicine services and ensured their smooth operation spending about 3 percent of his working time on these functions on average.

Six public communal facilities had six **system administrators** (software engineers) altogether, one administrator per public communal facility. They consulted or trained physicians and other personnel on how to work in the MIS, taught them the rules for data transmission via telephone, set up Internet connection and monitored its stability, controlled connection of diagnostic equipment with software and communication tools, and set up workstations. On average, they spent about 10 percent of their working time on these functions.

[21] Calculation: *column 5, lines 1.1, 2.1, 3.1:* (699 + 73 + 20) x 100 / 982 = 80.7%.

In 2022, the technical support of the regional telemedicine center was provided by eight full-time engineers and technicians, 17 computer operators, and a dispatch service.

Neither of the six private facilities reported technicians or system administrators involved in telemedicine.

Four facilities (including a private one) had **administrative personnel** involved in telemedicine. Public communal facilities had three employees of this category (12.5 percent of working time spent on telemedicine) or 0.3 percent of total personnel involved in telemedicine. For example, in one public communal facility, this category included the head of the analytics department, whose functions included establishing video and audio communication with other physicians and patients. One private facility had two administrative staff members who spent 50 percent of their working time providing telephone consultations to patients regarding tests, e-referrals, prescriptions, and health issues. The difference in time spent on telemedicine is explained by different functions of the analyzed administrative personnel.

Four public communal facilities had **psychologists** providing palliative or mental health care to patients and their relatives. They spent 37 percent of their working time on telemedicine on average, and among the facilities, this varied from 4.8 percent to 82.5 percent (consultations for palliative care patients and their relatives).

Two **occupational therapists** were involved in telemedicine at a pediatric polyclinic. They spent 23 percent of their time on remote communication with parents to assess the dynamics of the child's condition, monitor their treatment, including on the basis of parents' videos, as part of the child's individual rehabilitation plan.

Correlation between the number of telemedicine services and the number of physicians providing them. To identify the correlation between the number of telemedicine services and the number of physicians providing them, the study team analyzed the relevant 2022 data (Table 4.16).

Table 4.16: Number of doctor-to-patient telemedicine services and number of physicians providing them broken down by the type of provider, 2022. *Sources: facility data and eHealth*

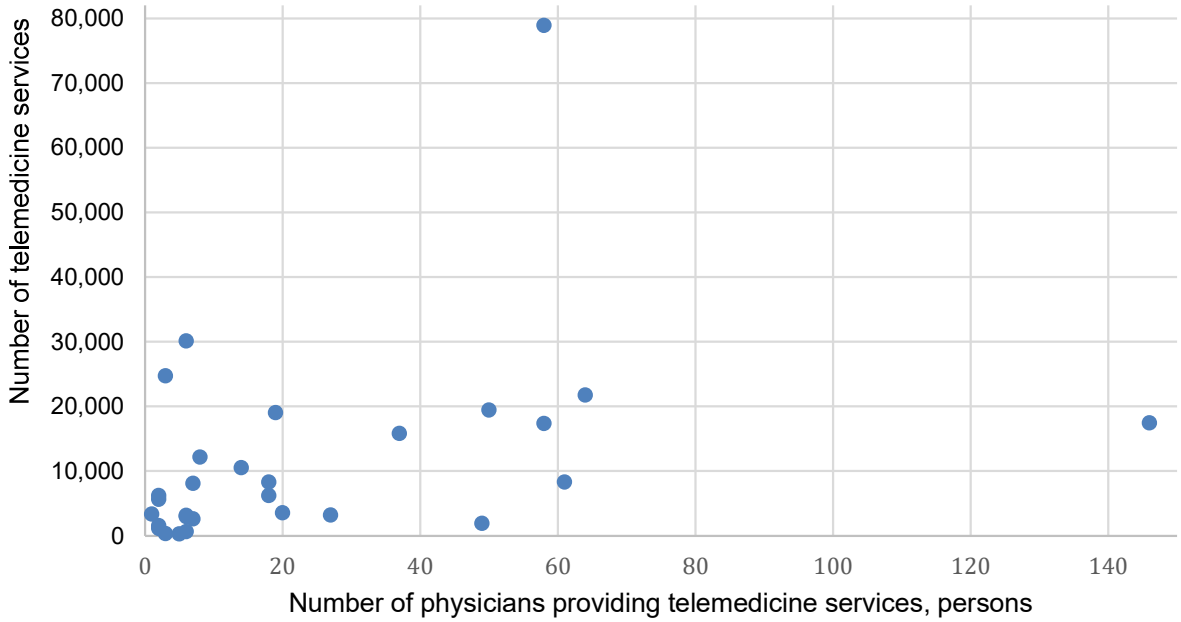
No.	Conventional name of the facility	Number of physicians providing telemedicine services, persons	Number of telemedicine services
Public Communal			
1.	**PHC, other outpatient packages 4***	**58**	**78,931**
2.	Tuberculosis	6	30,117
3.	Multidisciplinary hospital 1	8	12,174
4.	PHC, mobile palliative care 1	37	15,803
5.	HIV/AIDS 2	7	8,092
6.	Mobile palliative care 1	2	6,204
7.	Pregnancy, gynecology	18	6,196
8.	Mobile palliative care 7	20	3,533
9.	HIV/AIDS 3	1	3,331
10.	PHC, mobile palliative care 3	18	8,294
11.	HIV/AIDS 1	6	2,973
12.	**PHC 1***	**146**	**17,445**
13.	Multidisciplinary hospital 2	49	1,891

No.	Conventional name of the facility	Number of physicians providing telemedicine services, persons	Number of telemedicine services
14.	Mobile palliative care 3	64	21,749
15.	PHC, mobile palliative care 4	50	19,452
16.	PHC, mobile palliative care 5	3	24,718
17.	Mobile palliative care 4	14	10,517
18.	Multidisciplinary hospital 3	27	3,182
19.	Psychiatry, palliative care	6	3,138
20.	PHC, other outpatient packages 1	19	19,027
21.	**PHC, other outpatient packages 3***	**58**	**17,367**
22.	PHC, other outpatient packages 2	7	2,580
23.	PHC 2	61	8,317
Private			
24.	PHC, mobile palliative care 6	2	5,631
25.	PHC, mobile palliative care 7	2	1,545
26.	PHC, mobile palliative care 2	3	319
27.	Mobile palliative care 6	6	646
28.	Mobile palliative care 5	2	1,132
29.	Mobile palliative care 2	5	275

* Boldface indicates facilities that are analyzed in more detail below.

The graph based on the data in the table above shows that there is no direct correlation between the number of telemedicine services and the number of physicians providing them (Figure 4.17).

Figure 4.17: The number of doctor-to-patient telemedicine services and the number of physicians providing them, 2022. *Source: facility data*



Analysis of the data provided by several facilities (including the two that fall out of the general trend of the graph) confirms that there is no direct correlation between the number of physicians and the number of telemedicine services they provide.

In the **first** facility (municipal polyclinic), 58 physicians provided more than 78.9 thousand teleconsultations, with 55 percent under the PHC package (43.5 thousand). The average duration of such consultations, according to specialists was 15 minutes. This facility also provided consultations by means of telecommunication under the Outpatient Care (42 percent), Mobile Palliative Care, and Management of Pregnancy packages.

In the **second** facility (municipal polyclinic), the number of physicians involved in telemedicine is almost three times as high as that of the first facility (146 vs. 58), but they provided 17.4 thousand teleconsultations, with 84 percent under the PHC package (14.6 thousand). The average duration of such consultations, according to specialists, was 10 minutes. This facility also provided consultations by means of telecommunication under Outpatient Care (12 percent), Mobile Palliative Care, and Management of Pregnancy packages.

In another facility (district hospital) in 2022, 58 physicians (the number is similar to the number of physicians in the first facility) provided 17.4 thousand teleconsultations (the number is similar to the number of consultations in the second facility), with more than 90 percent of teleconsultations (15.6 thousand out of 17.4 thousand) provided under the PHC package. On average, according to the facility specialists, consultation lasted 15 minutes. This is the only facility, except for the regional telemedicine center, that created two PHC-level staff positions (General Practitioner/Family Doctor and Paramedic) to perform only telemedicine-related functions, but these positions have not been filled. The facility also provided consultations by means of telecommunication under the HIV, OST, Mobile Palliative Care, Dentistry, Management of Pregnancy, Tuberculosis PHC, and Outpatient Care packages (5.6 percent).

4.2.5. Medical information systems used by the participating facilities

MIS can be used to provide patients with the necessary primary and secondary care online (Table 4.17).

Table 4.17: MISs and their use in the analyzed facilities, 2022. ***Source: facility data***

No.	Type of care / type of facility	No. of facilities	Of these, facilities with MIS supporting telemedicine functionality	Of these, facilities with physicians using the telemedicine functionality of the MIS
1.	**Communal**	**23**	**6**	**4**
1.1.	Multidisciplinary hospital	3	1	1
1.2.	PHC and other outpatient packages (hospitals, polyclinics)	4	2	1
1.3.	Tuberculosis (regional tuberculosis dispensary)	1	0	0
1.4.	PHC and mobile palliative care (PHC center)	4	1	0
1.5.	HIV/AIDS (specialized centers, polyclinic)	3	0	0
1.6.	Mobile palliative care (children's and district hospitals, rehabilitation center for combatants, polyclinic association)	4	0	0
1.7.	Management of pregnancy, gynecology (maternity hospital)	1	0	0

No.	Type of care / type of facility	No. of facilities	Of these, facilities with MIS supporting telemedicine functionality	Of these, facilities with physicians using the telemedicine functionality of the MIS
1.8.	PHC (PHC center and polyclinic)	2	2	2
1.9.	Psychiatric and palliative care (regional institution for psychiatric care)	1	0	0
2.	**Communal (RTC)**	**1**	**1**	**1**
2.1.	Regional telemedicine center	1	1	1
3.	**Private**	**6**	**2**	**0**
3.1.	PHC and mobile palliative care (LLC)	3	2	0
3.2.	Mobile palliative care (LLC, PP)	3	0	0
	Total	**30**	**9**	**5**

The table shows that only nine out of 30 facilities had MIS with telemedicine functionality, and only five facilities used it to varying degrees to provide teleconsultations directly in the MIS. Among the six private facilities, two had MIS with telemedicine support, but none used it to provide services to patients.

The facilities that use MIS functionality for online consulting (except for the regional telemedicine center) reported that some physicians do not use the telemedicine module for such consultations; they prefer other ways of communicating with patients, although such methods in most cases ignore the issues of data security and confidentiality.

One of the facilities started introducing telemedicine services in 2021, and in 2022, most physicians of different specialties (traumatologist, gynecologist, neurologist, antenatal clinic) were already providing such services in the form of teleconsultations and telemetry. However, the facility believes that the teleconsultation functionality of the MIS is not a priority and that patients should be trained to use it first.

Out of 30 facilities, nine use the HELSI MIS, and although the telemedicine module is a standard feature of this MIS, only four of them used its capabilities. The regional telemedicine center uses the Medinet telemedicine MIS separately from the hospital's MIS. Askep and MEDEIR MISs are used by four facilities each; other MISs are used by one or two facilities (Table 4.18).

Table 4.18: MISs used in the analyzed facilities, 2022. ***Source: facility data***

MIS name	No. of facilities	%
Askep	4	*13%*
EvoMIS (Helsi since 2 May 2022)	1	*3%*
Health 24	1	*3%*
Helsi	7	*23%*
Helsi (for facility operation in general), Medics (for the Mobile Palliative Care package)	1	*3%*
Kashtan, Helsi	1	*3%*
Kashtan	1	*3%*
MedEir	4	*13%*
Medics	1	*3%*
Medinet (telemedicine MIS used separately from the hospital MIS)	1	*3%*
MedInfoService	1	*3%*

MIS name	No. of facilities	%
MedInfoService (for facility operation in general), HIV MIS (for the HIV package)	1	*3%*
Medstar	2	*7%*
SimplexMed	2	*7%*
SimplexMis	1	*3%*
Monitoring of Socially Significant Diseases Information System	1	*3%*
Total	**30**	***100%***

In 2022, some MIS developers maintained their software at no charge. These included the HIV MIS (in one facility), Helsi (in two facilities), Medics (in one facility), and *Monitoring of Socially Significant Diseases* Information System.

In general, the fee for MIS maintenance was fixed and set either per user or per workstation (one facility reported a case when 61 physicians worked at 31 MIS workstations). Other MIS payment terms were also applied. For example, if a user did not log in during a month, he/she was not charged for that month, but if they logged in at least once, a fixed amount was charged.

In three facilities, the MIS fee per employee ranged from 260 to 285 UAH per month, in nine facilities from 300 to 500 UAH per month, and in five facilities from 500 to 800 UAH. Three facilities reported no costs for MIS maintenance. The data for 10 facilities cannot be taken into account as they contain indicators of total expenditures either per employee or per workplace.

4.2.6. Noteworthy practices of telemedicine services provision

1998526 Public Communal Facility "ODESA REGIONAL CLINICAL HOSPITAL" OF ODESA REGIONAL COUNCIL (Regional Telemedicine Center)

Table 4.19: Selected facility performance indicators, 2020–2022. *Source: facility data*

Indicator	2020	2021	2022
Number of doctor-to-doctor services provided, units	4,260	4,015	3,915
Average number of personnel involved in telemedicine, persons	104, including 71 physicians	103, including 75 physicians	98, including 73 physicians

In 2019, Odesa region was the first in Ukraine to create a vertically integrated system of teleconsultations, which includes 105 medical facilities, from family practice outpatient clinics, central district hospitals to tertiary regional hospitals.

In 2019, the facility conducted an advertising campaign to inform about its teleconsultation activities (banners, T-shirts, leaflets, signboards, and other).

The center aids physicians in the Odesa region in the form of doctor-to-doctor teleconsultations in a specialized Medinet MIS. To improve the quality of telemedicine services, the facility encourages physicians by paying them monetary rewards from its own budget for each teleconsultation.

The telemedicine MIS is not directly integrated with eHealth, as the eHealth CDB does not have functional technical solutions for telemedicine (NHSU, together with MOH, SOE eHealth, and partners, are currently working on their development), so the data are stored on servers. When physicians connect to the system, they can only see EHR within their

facilities, but when they contact the dispatcher, the information stored in the MIS can be made available to another physician in accordance with internal regulations.

The need to transport patients from other health facilities to Odesa Regional Clinical Hospital by an emergency team or to have a specialist visit a patient is determined after teleconsultations with physicians. The aim is to reduce the number of unnecessary patient visits by specialists. These communications are carried out on the basis of a call center.

Also, there are more than 200 telemetry mobile diagnostic systems in the region (which are on the balance sheet of other hospitals), so paramedics use a tablet to transmit patient information (case history) to the telemedicine MIS.

In addition, as a component of the telemedicine network, the region uses the software to hold video conferences, calls, and meetings of the medical community.

Small data (such as patient registration data, case histories, consultation descriptions, photos, statistics) are stored on the MIS servers. Bigger data (such as DICOM images and laboratory diagnostics) are stored on the local server of the hospital.

The Regional Telemedicine Center includes:

- A dispatch service (call center), where operators process telemedicine requests and redirect them to the physicians, monitor the fulfillment of telemedicine consultation requests and the quality of the consultation report.
- IT support department responsible for the telemedicine platform operation. Technical specialists administer the platform around the clock and at the same time serve as physician coordinators.

01110765 Public Communal Facility "KYIV CITY CLINICAL HOSPITAL NO. 11" OF THE EXECUTIVE BODY OF KYIV CITY COUNCIL (KYIV CITY STATE ADMINISTRATION)

Table 4.20: Selected facility performance indicators, 2022. *Sources: facility data and eHealth*

Indicator	Value
1. Total number of doctor-to-patient interactions	65,010
1.1. Of these, by means of telemedicine	12,174, or 18,7%
1.1.1. Most of them under the Mobile Palliative Care package	6,490, or 53%
1.1.2. Other packages: HIV, Outpatient Care, Management of Pregnancy	5,684, or 47%
2. Average number of personnel involved in telemedicine, persons	15, including 8 physicians

Interaction with patients is carried out with the help of Helsi MIS, which has a standard telemedicine module and does not require additional usage fee. The functionality of the telemedicine module can be expanded, but facility specialists claim that it is too expensive for them.

Physicians of the facility use teleconsultations to counsel palliative care and antenatal clinic patients. Physicians involved in palliative care clarify the patient's condition by phone to determine what is more appropriate—a consultation or a home visit. With the functionality of the module, one can simultaneously communicate with the patient and see their medical profile. In addition, if necessary, the patient can provide information via Viber, which is installed on the doctor's computer, and the doctor can simultaneously upload this information to MIS.

Each patient can create a personal MIS account by registering in Helsi app on their phone. Physicians inform patients about this possibility during appointments and consultations. Also, there are banners with this information in the hospital.

The facility has a mammography machine provided by the Department of Health with a special software that allows radiologists and X-ray technicians send X-rays to other specialists, including those at the city oncology center (under the Mammography package). The specialists were trained to use this software (the training was free for the facility). Conclusion on the patient's condition is provided by both the facility physician and oncology center specialists, whose services are not paid for by the facility.

The facility also has an X-ray machine with hardware and software (purchased by the facility in 2021) that allows transferring X-ray images to those facility physicians who have installed the software.

Instead of a server, the facility uses cloud software, PACS24, which allows any computer in the facility to view X-rays or a digital archive of medical images.

Various functionalities of telemedicine services were made possible by the policy of the hospital management and due to the support of IT Service, whose employees introduce the latest technologies for the provision of health services, train and advise medical staff on entering data into MIS, monitor the work of physicians in MIS, and other.

01999678 Public Communal Facility "LEONID KUROEDOV 4TH CITY CLINICAL HOSPITAL OF POLTAVA CITY COUNCIL"

Table 4.21: Selected facility performance indicators, 2022. ***Sources: facility data and eHealth***

Indicator	Value
1. Total number of doctor-to-patient interactions, units	189,763
1.1. Of these, by means of telemedicine	3,182, or 1.7%
1.1.1. Most of them under the Mobile Palliative Care package	1,467, or 46%
1.1.2. Other packages: Outpatient Care, Management of Pregnancy, Dentistry	1,715, or 54%
2. Average number of personnel involved in telemedicine, persons	54, including 27 physicians

Patients are consulted by phone. The facility also uses the Tredex Telecard software to provide doctor-to-doctor consultations. The software allows for ECG transmission from family medicine outpatient clinics to narrow specialists of the facility who consult family physicians of the outpatient clinics on the basis of the received ECGs.

The UCARD 100 electrocardiograph installed in the inpatient department can transfer files via a mobile data transmission module (the device has a SIM card) to the regional emergency center or to the cardiovascular center (by default). This software is maintained by software engineers of the analytics department, and only depreciation is included in the costs.

02774705 Public Communal Facility "CHILDREN'S CITY POLYCLINIC NO. 6" OF ODESA CITY COUNCIL

Table 4.22: Selected facility performance indicators, 2022. *Source: facility data and eHealth*

Indicator	Value
1. Total number of doctor-to-patient interactions, units	232,394
1.1. Of these, by means of telemedicine	19,027, or 8.2%
1.1.1. Most of them under the PHC package	9,957, or 52.3%
1.1.2. Other packages: Outpatient Care, Mobile Palliative Care, Child Rehabilitation, Rehabilitation of the Nervous System	9,070, or 47.7%
2. Average number of personnel involved in telemedicine, persons	15, including 12 physicians

To provide medical care, the facility uses videos filmed by parents of sick children. In these videos, they perform exercises with their children. Parents send videos by phone to specialists (occupational therapists and physical rehabilitation specialists) who assess the quality and effectiveness of the exercises or adjust the individual rehabilitation plan drawn up at the onset of the child's rehabilitation. In addition, specialists call parents to get information about the dynamics of the child's condition.

01984636 Public Communal Facility "CLINICAL EMERGENCY HOSPITAL" OF DNIPRO CITY COUNCIL

Table 4.23: Selected facility performance indicators, 2022. *Sources: facility data and eHealth*

Indicator	Value
1. Total number of doctor-to-patient interactions, units	444,657
1.1. Of these, by means of telemedicine	1,891, or 0.4%
1.1.1. Most of them under the Outpatient Care package	1,409, or 74.5%
1.1.2. Other packages: HIV, Dentistry, Mobile Palliative Care, Management of Pregnancy	482, or 25.5%
2. Average number of personnel involved in telemedicine, persons	50, including 49 physicians

The physicians consult patients by phone, Viber, and Telegram. At the end of 2022, the facility put into operation the Teladoc telemedicine software and hardware complex that was received as charitable aid from MOH.

This complex is a mobile computer designed to create the effect of a virtual presence of a physician by the patient's side. The complex is in one of the hospital's buildings and operates within a network that includes four service locations. With this complex, a physician can obtain information about the patient through real-time video and sound, but the data are not stored on the device. Specialists who are physically located in three different hospital buildings join the network and consult patients remotely; they can see and hear the patient. If necessary, they can visualize and enlarge the image, examine areas with pathological changes in the smallest detail. The Teladoc examination is recorded in Kashtan MIS, which does not have a telemedicine module.

4.2.7. Results of a survey of physicians with regard to organizing teleconsultations

At the request of NHSU, the study team conducted a survey of physicians to obtain information about the organization of teleconsultations and about the physicians who provided such consultations. The survey questionnaire was answered by 114 healthcare professionals from 23 participating facilities.

Main conclusions from the survey:

- Seventy percent of the respondents answered that patients can book a teleconsultation; in most cases, such an appointment is made online or by phone at the reception of the facility.
- The main means of communication with patients:
  - Mobile communication
  - SMS or messengers
  - Audio/video communication via Viber
- The most common frequency of teleconsultations (33 percent of respondents) is two to five consultations per day.
- Eleven percent of physicians consult patients by phone even if they are examining another person at the same time.
- Seventy-three percent of physicians consult patients remotely outside of working hours.
- Seventy-four percent of physicians provide repeated consultations to a patient remotely even if they do not have a declaration with this patient.
- Sixty-five percent of respondents record teleconsultations in eHealth, and 24 percent record them in paper journals.
- For most respondents, teleconsultations last up to 20 minutes.
- The main users of remote consultations are patients with chronic diseases and people with limited mobility.

Detailed results of the survey are presented in **Annex 2**.

5. CONCLUSIONS

Currently, only doctor-to-patient teleconsultations are recorded in eHealth, and no data on teleradiology, telemetry, or doctor-to-doctor consultations are recorded.

The absolute number of teleconsultations is growing, but their share in total consultations is still small—about 5 percent.

Not all study participants had investments in telemedicine assets, and the share of such investments was insignificant—no more than one percent of total resource provision of the facilities.

All facilities incurred costs associated with the provision of telemedicine services. Labor costs (including the unified social contribution) were the largest share of these costs. At the same time, there were no spending at all on training for personnel or patients on telemedicine introduction or delivery.

The scope of telemedicine services and resources for their provision differed significantly among facilities. The data do not show a direct correlation between the scope of services and resources for their provision.

Personnel involved in telemedicine spent seven to nine percent of their working time on it on average.

Telemedicine delivery costs were mainly covered by PMG payments.

6. POLICY CONSIDERATIONS

Telemedicine provision under PMG

- Clarify and communicate with health providers on updated PMG packages that require the use of telemedicine.
- Train both physicians and patients on the use, content, and benefits of telemedicine methods.
- Introduce a system to monitor facility performance in terms of telemedicine services using eHealth data-based indicators. Report data back to health facilities.
- Conduct cost analysis in facilities that use high-tech equipment to provide telemedicine services by means of telemetry and teleradiology for possible inclusion of such equipment in medical package requirements; study the impact of such costs on the overall costs of facilities.

eHealth development

- Continue developing and improving eHealth functionalities related to telemedicine (teleconsultations, telemetry, teleradiology).

Decision-making on telemedicine investments

- Strengthen the role of facility managers in investment decisions on telemedicine equipment made by local authorities, MOH or donors.
- Accompany telemedicine investments with personnel training and business processes to ensure that these resources are adequately utilized.

Telemedicine delivery at facility level

- Build capacity of facility managers based on the understanding of the principles, essence, and benefits of telemedicine.
- Organize compulsory training for facility personnel that have telemedicine equipment with data transmission function to use its functionality in full.
- Introduce an internal system of accounting for the use of technologies and telemedicine delivery, as well as a system of internal incentives for personnel for the purpose of developing and supporting telemedicine.
- Involve technical personnel, engineers, and system administrators to provide technical support of telemedicine service delivery.

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8. ANNEXES

Annex 1. eHealth Data

Table 8.1: Number of telemedicine services and facilities that provided them broken down by medical specialties, 2022. *Source: eHealth*

Medical specialty	Total facilities	Of these, facilities providing telemedicine services	Total services	Of these, telemedicine services	*Share of all services, %*
General practice / family medicine	1,925	1,741	45,546,260	3,603,403	*7.91%*
Pediatrics	1,636	1,117	12,110,899	1,101,417	*9.09%*
Therapy	1,832	1,184	11,155,954	940,220	*8.43%*
Phthisiology	337	155	1,344,124	222,338	*16.54%*
Infectious diseases	630	314	1,436,387	187,963	*13.09%*
Obstetrics and gynecology	990	598	7,680,219	171,347	*2.23%*
Endocrinology	683	339	2,622,719	90,830	*3.46%*
Neurology	946	444	5,137,896	87,219	*1.70%*
Psychiatry	600	308	2,737,450	59,665	*2.18%*
Oncology	380	169	888,541	49,694	*5.59%*
Surgery	889	394	4,248,885	41,010	*0.97%*
Cardiology	665	271	2,260,926	31,022	*1.37%*
Pediatric phthisiology	68	37	170,283	24,707	*14.51%*
Pediatric neurology	275	134	750,278	24,019	*3.20%*
Dermatology and venereology	735	279	2,814,465	23,643	*0.84%*
Orthopedics and traumatology	770	288	3,951,786	20,169	*0.51%*
Otolaryngology	836	287	3,318,144	20,020	*0.60%*
Pediatric psychiatry	141	61	303,115	18,463	*6.09%*
Ophthalmology	822	280	3,408,203	17,771	*0.52%*
Narcology	418	136	1,235,021	16,867	*1.37%*
Medical psychology	113	37	104,572	15,907	*15.21%*
Emergency medicine	162	22	229,965	15,395	*6.69%*
Urology	627	221	1,512,078	13,770	*0.91%*
Childhood infectious diseases	169	52	115,361	12,476	*10.81%*
Pediatric endocrinology	139	78	307,010	9,224	*3.00%*
Psychotherapy	90	35	53,511	8,830	*16.50%*
Gastroenterology	275	112	712,085	7,508	*1.05%*
Rheumatology	202	79	440,884	7,318	*1.66%*
Pediatric gynecology	163	64	205,368	5,876	*2.86%*
Pediatric anesthesiology	51	11	12,908	5,250	*40.67%*
Pediatric gastroenterology	95	48	148,290	5,181	*3.49%*
Pediatric otolaryngology	300	100	842,684	4,404	*0.52%*
Pediatric orthopedics and traumatology	204	58	619,157	3,614	*0.58%*
Pediatric cardiorheumatology	142	59	302,373	3,505	*1.16%*
Pediatric hematology	45	21	41,892	3,324	*7.93%*

Medical specialty	Total facilities	Of these, facilities providing telemedicine services	Total services	Of these, telemedicine services	*Share of all services, %*
Pediatric ophthalmology	258	72	786,302	3,182	*0.40%*
Physical therapy and rehabilitation	315	51	1,025,185	3,015	*0.29%*
Pediatric nephrology	63	23	59,980	2,827	*4.71%*
Functional diagnostics	274	37	258,630	2,764	*1.07%*
Pediatric dermatovenereology	118	43	195,347	2,740	*1.40%*
Physical therapy	161	25	315,300	2,713	*0.86%*
Anesthesiology	312	26	73,765	2,678	*3.63%*
Pulmonology	198	67	295,632	2,526	*0.85%*
Pediatric allergology	80	31	110,062	2,388	*2.17%*
Oncological surgery	112	37	394,276	2,168	*0.55%*
Physiotherapy	376	60	1,411,665	2,117	*0.15%*
Medical genetics	53	12	63,817	2,085	*3.27%*
Pediatric dentistry	202	47	768,845	1,854	*0.24%*
Dentistry	510	102	1,711,339	1,850	*0.11%*
Hematology	75	34	127,270	1,840	*1.45%*
Adolescent therapy	47	8	68,493	1,801	*2.63%*
Radionuclide diagnostics	6	2	3,702	1,597	*43.14%*
Proctology	125	34	127,049	1,543	*1.21%*
Pediatric surgery	245	72	664,839	1,541	*0.23%*
Radiology	332	22	407,715	1,200	*0.29%*
Pediatric immunology	48	20	37,407	1,163	*3.11%*
Allergology	69	29	99,087	1,113	*1.12%*
Gynecologic oncology	61	20	137,536	1,095	*0.80%*
Surgical dentistry	308	68	763,569	1,081	*0.14%*
Pediatric pulmonology	52	21	39,447	1,009	*2.56%*
Endoscopy	721	67	417,485	988	*0.24%*
Ultrasound diagnostics	477	67	374,063	928	*0.25%*
Nephrology	138	37	1,237,860	789	*0.06%*
Healthcare management and organization	100	20	68,210	607	*0.89%*
Therapeutic dentistry	261	53	726,771	588	*0.08%*
Pediatric oncology	28	8	12,852	452	*3.52%*
Occupational therapy	108	13	129,492	449	*0.35%*
Pediatric urology	55	13	66,455	433	*0.65%*
Vascular surgery	76	15	93,666	370	*0.40%*
Sports medicine	24	2	52,065	257	*0.49%*
Neonatology	157	17	23,831	196	*0.82%*
Psychophysiology	3	1	1,242	194	*15.62%*
Surgery of the heart and major vessels	32	3	18,991	177	*0.93%*
Clinical immunology	19	3	14,761	168	*1.14%*
Surdology	59	12	98,064	160	*0.16%*
Transfusiology	27	3	11,082	159	*1.43%*
Aviation and space medicine	7	2	2,856	130	*4.55%*
Exercise therapy	90	10	157,480	116	*0.07%*
Neurosurgery	104	17	105,767	103	*0.10%*

Medical specialty	Total facilities	Of these, facilities providing telemedicine services	Total services	Of these, telemedicine services	*Share of all services, %*
Sexual pathology	12	3	22,466	99	*0.44%*
Immunology	12	1	4,464	82	*1.84%*
Clinical laboratory diagnostics	86	4	71,068	81	*0.11%*
Occupational pathology	56	11	52,564	40	*0.08%*
Combustiology	27	2	8,843	24	*0.27%*
Reflexology	40	8	18,369	24	*0.13%*
Physical therapy and sports medicine	39	4	115,393	20	*0.02%*
Otolaryngological oncology	22	3	28,801	14	*0.05%*
Bacteriology	24	1	16,619	10	*0.06%*
Radiation therapy	31	4	92,458	9	*0.01%*
Orthopedic dentistry	17	3	11,694	8	*0.07%*
Thoracic surgery	62	4	25,348	8	*0.03%*
Pediatric cardiology	7	1	2,025	7	*0.35%*
Epidemiology	11	2	1,742	6	*0.34%*
Orthodontics	9	1	3,149	4	*0.13%*
Virology	2		33		
Laboratory genetics	1		415		
Geriatrics	4		8,727		
Pediatric neurosurgery	12		6,682		
Dietetics	15		2,429		
Interventional cardiology	6		546		
Clinical biochemistry	11		1,058		
Laboratory immunology	3		19		
Microbiology and virology	2		2		
Traditional and alternative medicine	1		34		
Pathological anatomy	3		13		
Sanology	1		3,655		
Toxicology	2		492		
Transplantology	5		451		
Total	**3,219**	**2,844**	**132,828,504**	**6,930,959**	***5.22%***

Table 8.2: Number of telemedicine services and facilities that provided them broken down by regions, 2022. *Source: eHealth*

Region	Total facilities	Of these, facilities providing telemedicine services	Total services	Of these, telemedicine services	*Share of all services, %*
Kharkiv Region	190	176	8,476,674	948,283	*11.19%*
Kyiv city	195	165	10,464,755	658,653	*6.29%*
Dnipropetrovsk Region	239	212	13,236,093	506,224	*3.82%*
Lviv Region	198	176	9,948,591	485,743	*4.88%*
Khmelnytsky Region	112	96	6,773,755	378,424	*5.59%*

Region	Total facilities	Of these, facilities providing telemedicine services	Total services	Of these, telemedicine services	*Share of all services, %*
Sumy Region	122	111	4,589,705	310,946	*6.77%*
Ivano-Frankivsk Region	147	131	5,902,902	297,750	*5.04%*
Poltava Region	131	116	6,107,608	281,892	*4.62%*
Kirovohrad Region	107	95	3,755,293	281,176	*7.49%*
Odesa Region	230	187	7,773,992	265,740	*3.42%*
Chernihiv Region	78	74	3,624,215	249,176	*6.88%*
Chernivtsi Region	86	82	4,334,738	204,674	*4.72%*
Volyn Region	81	73	4,073,880	204,001	*5.01%*
Kyiv Region	143	132	5,192,407	187,642	*3.61%*
Ternopil Region	106	101	4,430,713	182,354	*4.12%*
Vinnytsia Region	151	128	4,703,408	181,625	*3.86%*
Rivne Region	134	116	5,009,083	181,591	*3.63%*
Zaporizhzhia Region	125	112	4,278,015	176,373	*4.12%*
Zhytomyr Region	114	104	4,803,058	157,555	*3.28%*
Cherkasy Region	96	80	4,783,729	155,386	*3.25%*
Luhansk Region	43	39	648,603	144,496	*22.28%*
Donetsk Region	93	77	2,151,103	134,839	*6.27%*
Kherson Region	89	75	1,092,706	128,745	*11.78%*
Mykolaiv Region	88	83	2,883,327	118,855	*4.12%*
Zakarpattia Region	121	103	3,790,151	108,816	*2.87%*
Total	**3,219**	**2,844**	**132,828,504**	**6,930,959**	***5.22%***

Annex 2. Results of a survey of physicians

Figure 8.1: Facilities (N=23) and employees (N=114) that participated in the survey, persons

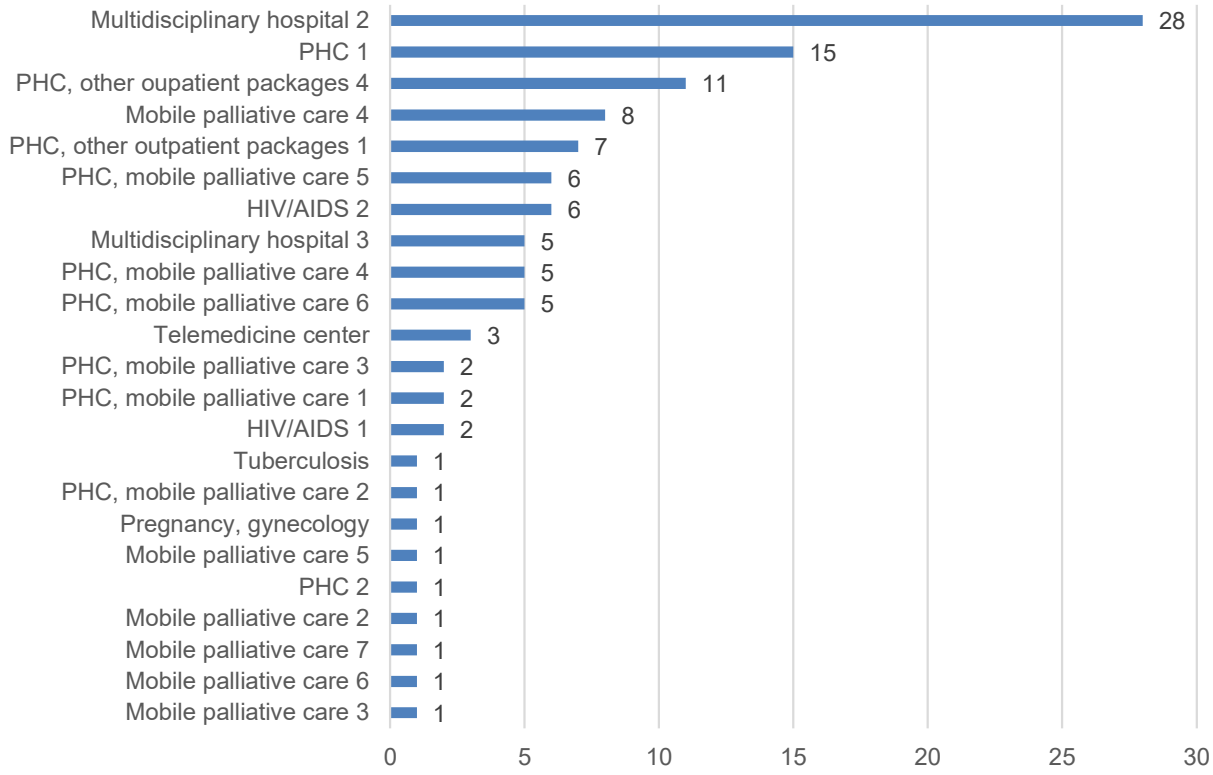


Figure 8.2: Breakdown of respondents by specialty (N=114), persons

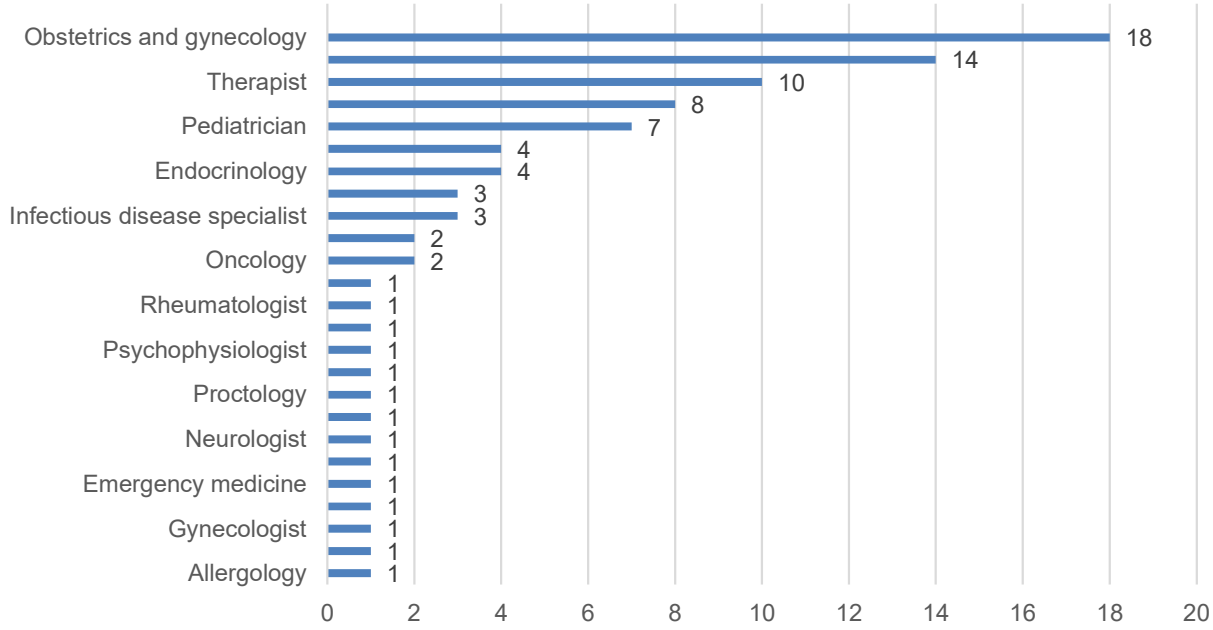


Figure 8.3: Breakdown of answers to the question *"Can patients book a teleconsultation (remotely)?"* (N=114), %

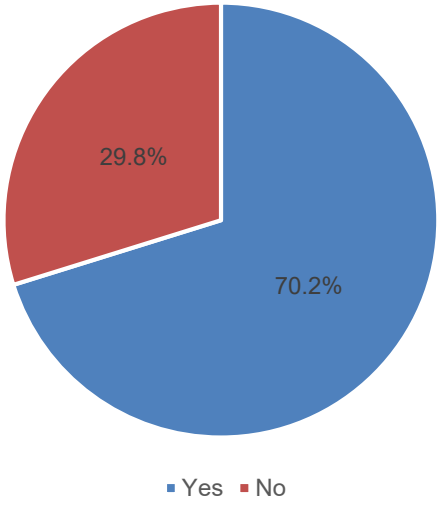


Figure 8.4: Breakdown of answers to the question *"If yes, how can they do it?"* (N=114)

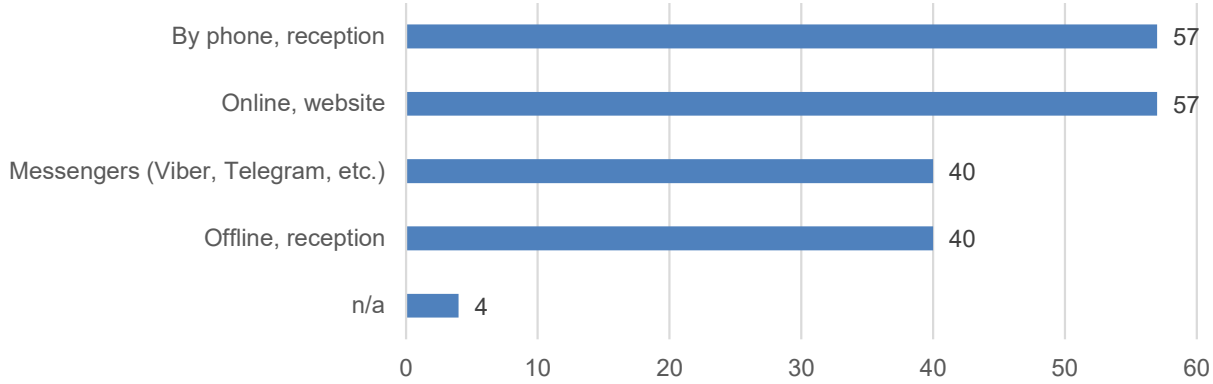


Figure 8.5: Breakdown of answers to the question *"What types of communication do you use? Please indicate the approximate percentage"* (N=114), %.

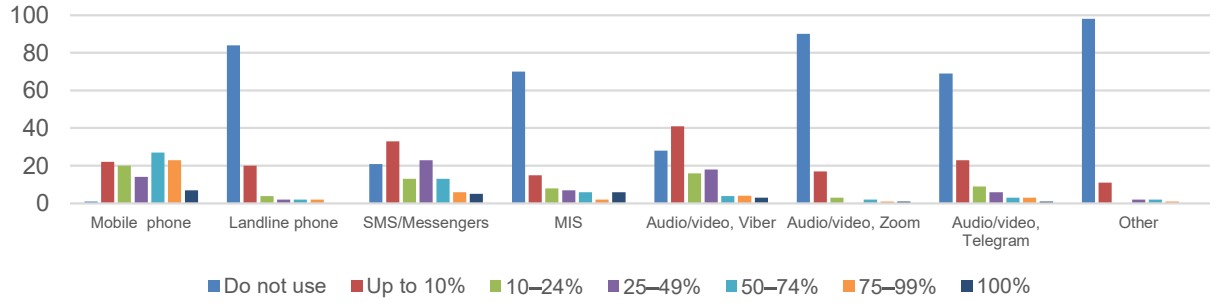


Figure 8.6: Breakdown of answers to the question *"How often do you consult patients via telemedicine (remotely)? Please select the most appropriate answer"* (N=105), %.

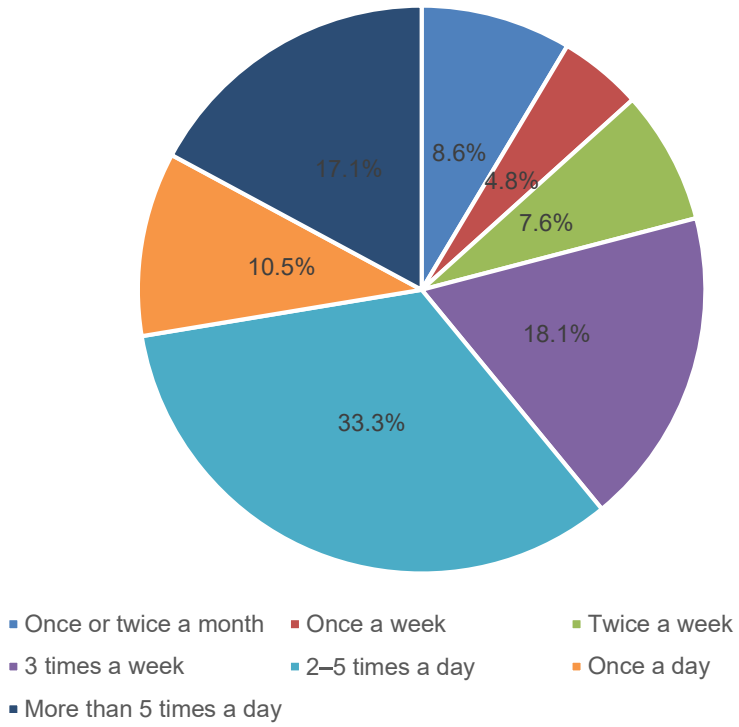


Figure 8.7: Breakdown of answers to the question *"Do you keep separate medical records for patient teleconsultations (conducted remotely)?"* (N=114), %

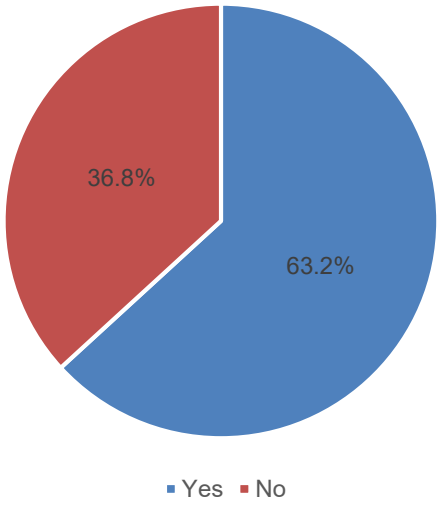


Figure 8.8: Breakdown of answers to the question *"If yes, please specify the type of records"* (N=114)

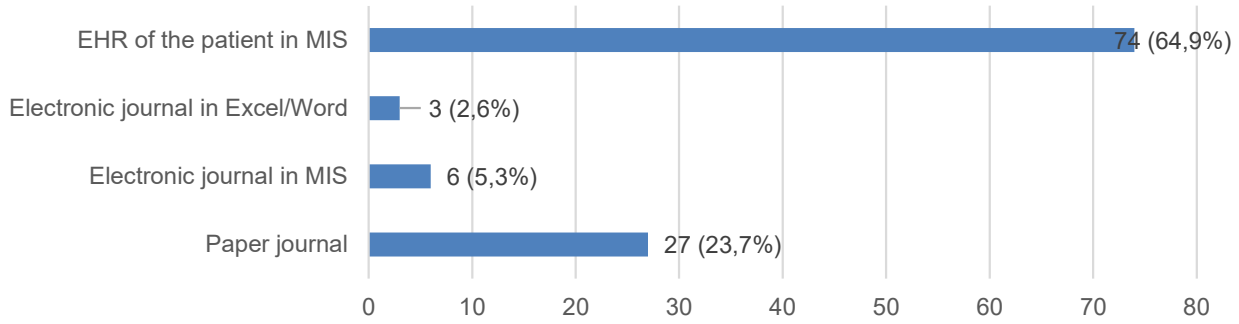


Figure 8.9: Breakdown of answers to the question *"What percentage of teleconsultations (conducted remotely) do you record in the patient's EHR? Please select the most appropriate answer"* (N=112), %

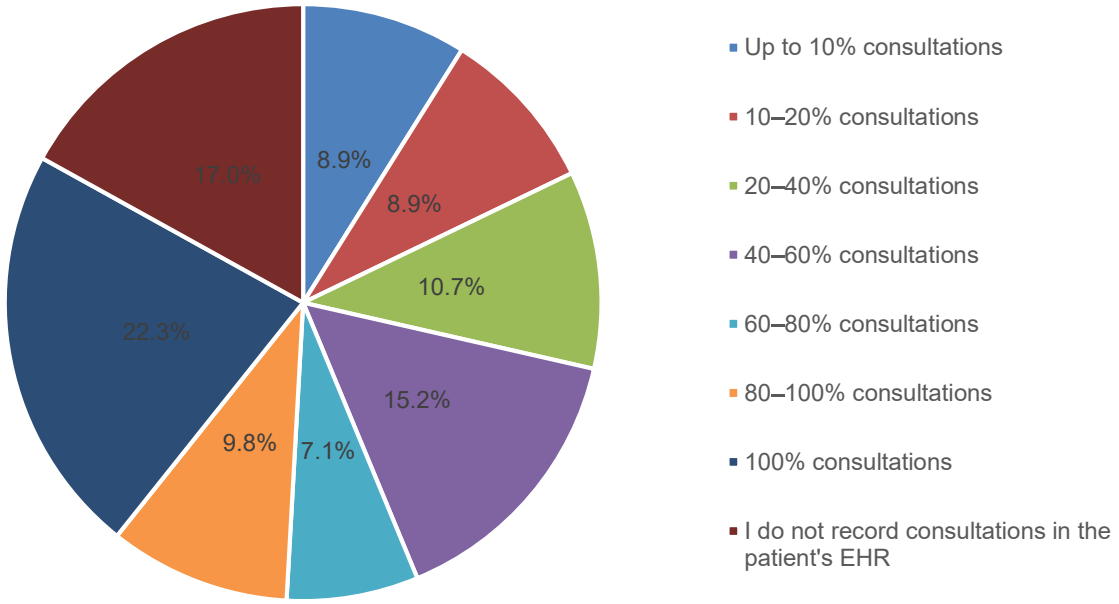


Figure 8.10: Breakdown of answers to the question about certain aspects of consultation (N=114), %

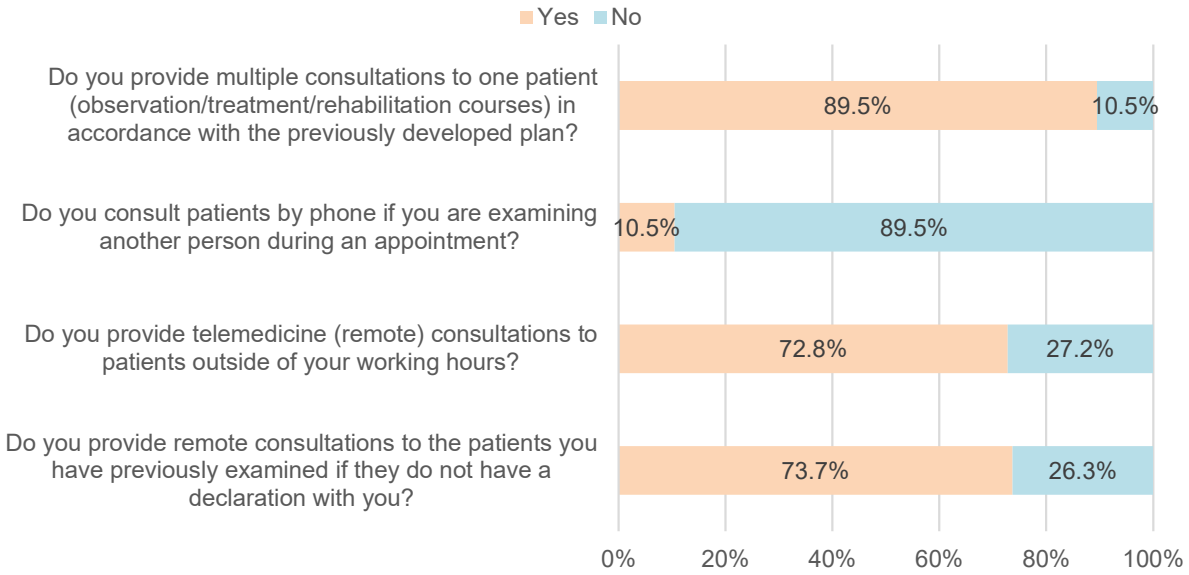


Figure 8.11: Breakdown of answers to the question about the most common medical reasons for communicating via telemedicine (N=114), %

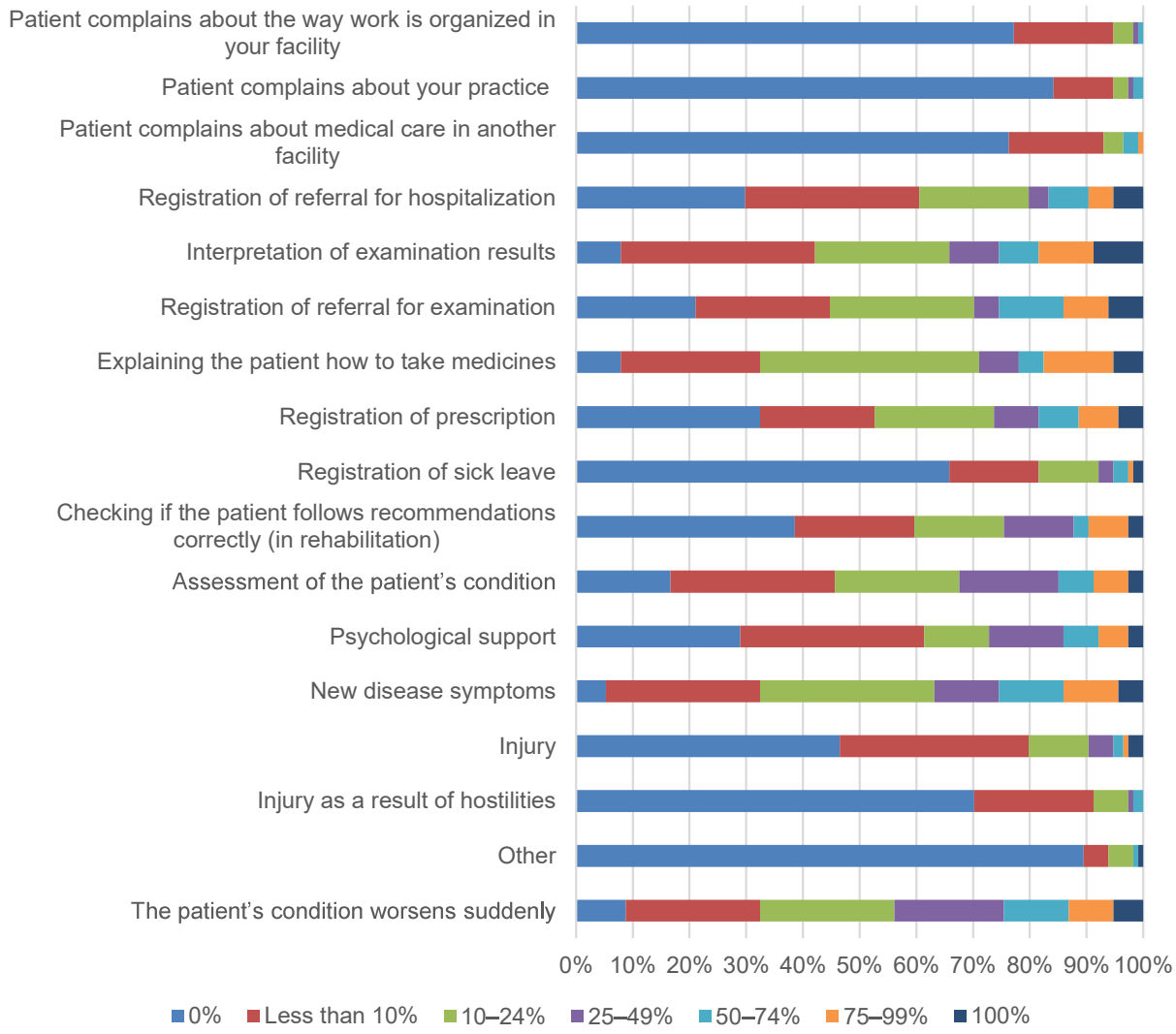


Figure 8.12: Breakdown of answers to the question about the most common non-medical reasons for communicating via telemedicine (N=114), %

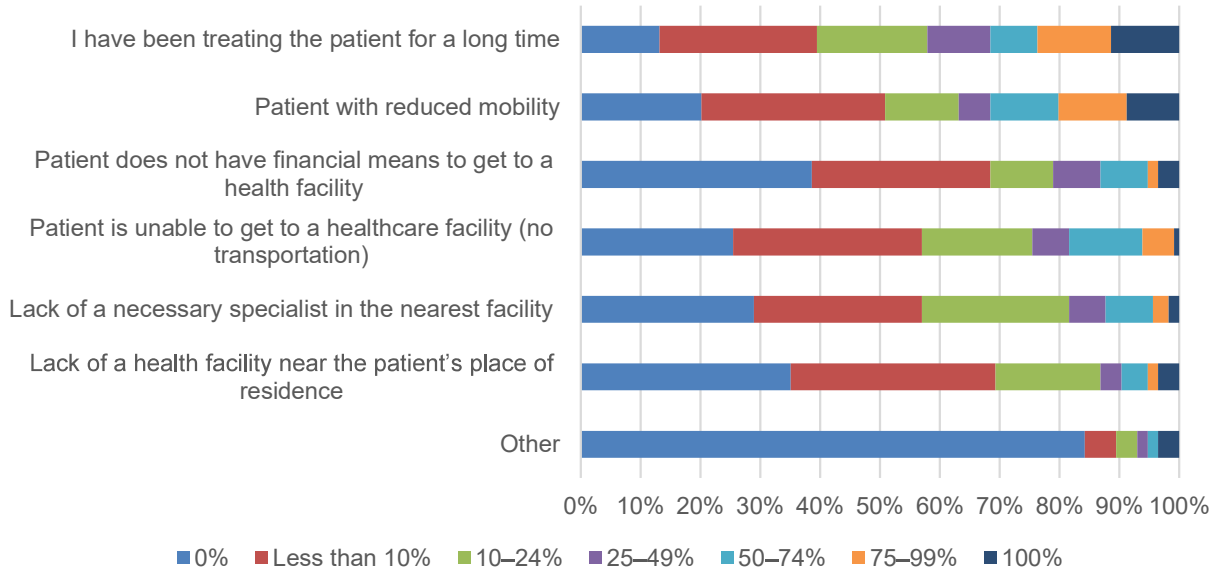


Figure 8.13: Breakdown of answers to the question *"Please indicate the approximate duration of your remote consultations"* (N=114), %

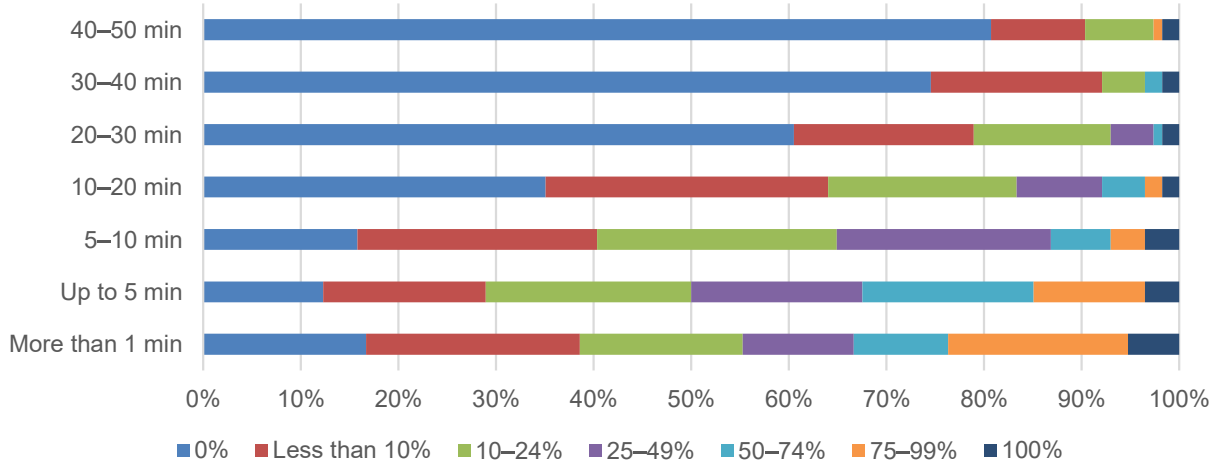


Figure 8.14: Breakdown of answers to the question *"What are the most common reasons for multiple consultations for one patient?"* (N=114), %

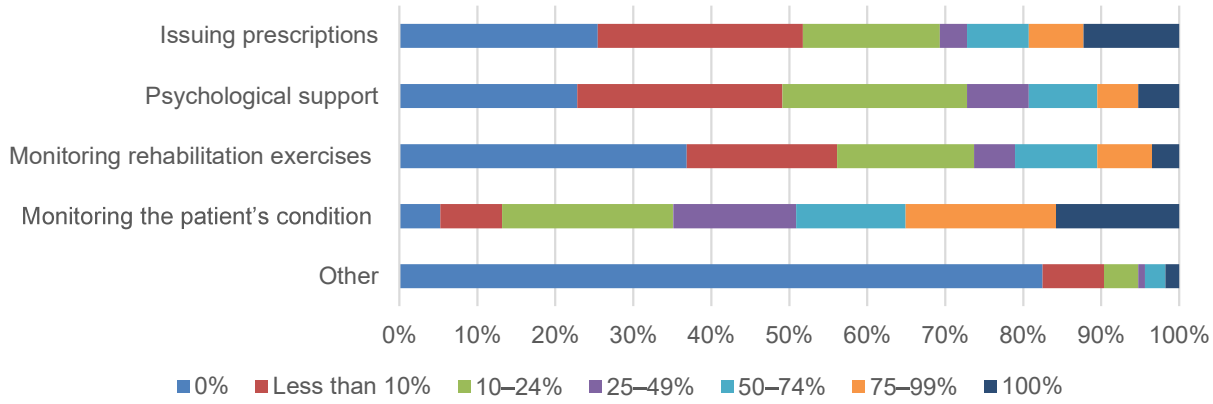


Figure 8.15: Breakdown of answers to the question *"Which groups of patients receive health/rehabilitation services via telemedicine most often?"* (N=114), %

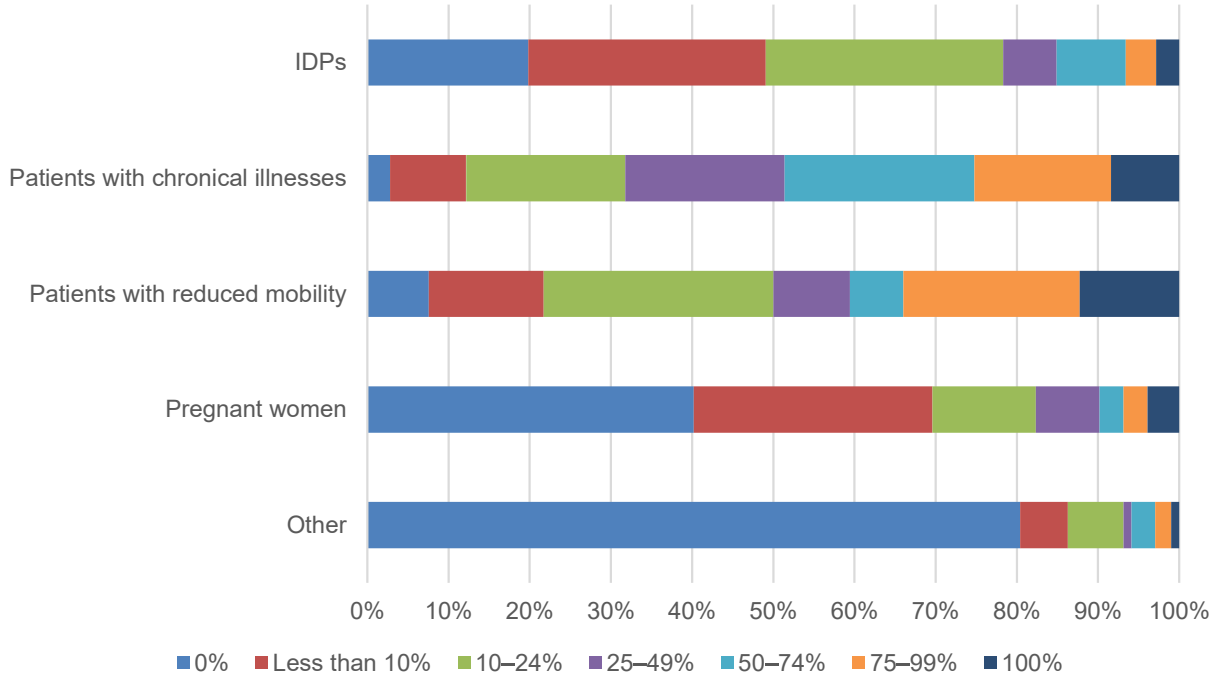
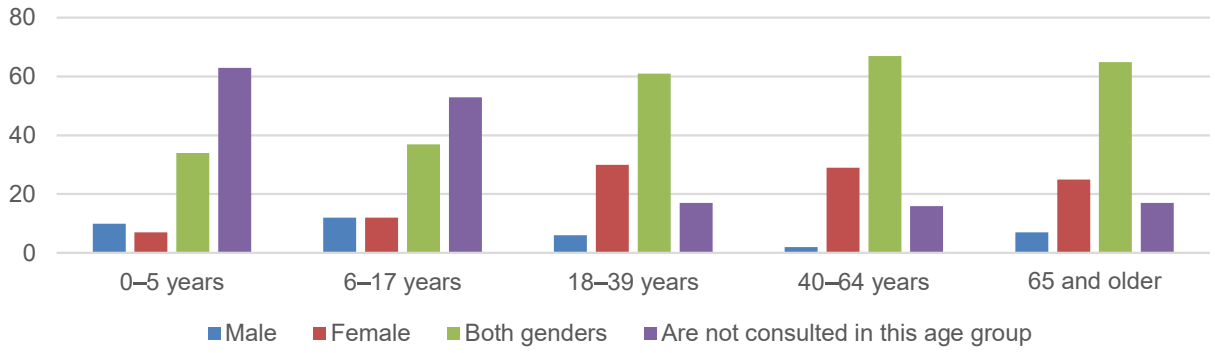


Figure 8.16: Breakdown of answers to the question *"What is the predominant age and gender of the patients you consult remotely?"* (N=114), %



Annex 3. Questions most frequently asked by healthcare workers during study data collection

About telemedicine service accounting:

- Where can I get information on the number of telemedicine services provided?
- We provide consultations only by phone, we do not provide telemedicine services. Are we eligible for participation?
- Can we report all the costs and you will choose what you need?

About the equipment:

- What is considered telemedicine equipment?
- If we have equipment but do not use it, should we mention it in the data collection forms?

About cost accounting:

- Which groups of nomenclature items or cost items are used to record telemedicine delivery costs (in specific cases)?
- If you consult only by phone, and the phone belongs to the physician, where do the costs arise?

On personnel involvement accounting:

- How do we determine which physicians provide telemedicine services?
- How do we determine which employees, other than physicians, perform telemedicine functions?

How do we determine the time during which other employees perform telemedicine functions?