ISSN 2661-2666 (Online) International Scientific Journal Monte (ISJM) DOI: 10.33807/monte.20222539
Volume 6, (No).2 (2022): April

INFORMATION TECHNOLOGY EQUIPMENT AND ITS APPLICATION IN HEALTHCARE

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Abstract

Information technological developments are increasingly being applied in the Health Sciences. As a direction, health technological development is the interdisciplinary field that studies and pursues the effective use of biomedical data, information and knowledge for scientific research, education, problem solving and decision making to improve human health. Medical Technological Developments supports many applications in the field of medicine, aids modeling, simulation, experimentation and translation across the spectrum from molecules to individuals and populations, from biological systems to social ones, intervening in research and basic and clinical healthcare practices. This relatively new science in medicine develops, studies and applies the theory, methods and processes for the generation, storage, retrieval, use, management and exchange of biomedical data, information and knowledge. Technology in the last decade in medical sciences as well as applying them in specific sectors have made a modern and successful journey for the fact that medicine is one of the sciences, where technology has shown its priority, and this can be analyzed with an analysis concrete of the remote operation which was realized through the robot and has been quite successful.

The purpose of this paper is to provide sufficient knowledge about the development and application of health information technology in Kosovo, disease management system and to improve health care and provide accurate information on patient records. Technological developments in the region will be analyzed and a comparability will be made between the public and private sector in Kosovo.

Keywords: *equipment, technology, applications, health*

Introduction

Comparability and analysis of technological developments will be done on how much they use Information technology and other technologies in the public and private sectors in Kosovo institutions, where it is known that in Kosovo there is a very good investment of information technology which these technological devices use software with different algorithms to analyze as accurately and quickly as possible the data of diagnosis and identification of the disease as accurately as possible. The application of information technology aims to promise and provide doctors with clearer medical results, as well as reduce the time required to analyze health care data from systems that hold medical records in a logical structure, along with patient historical records quickly and smoothly.

1.0 History of medical technology in health

Information technology devices are healthcare providers who are expected to evaluate all relevant study test data plus information from other sources before making a diagnosis and designing a treatment plan. Careful evaluation and review of the test with information technology increases the reliability of a diagnosis and reduces the possibility of medical errors. Data from medical device tests are part of the set of information that should be considered when a physician makes a diagnosis. A retest or other test to confirm the findings may be appropriate for the patient who underwent the examination.

With information technology technology equipment in health can be applied by:

- Managers of hospitals / clinics
- Doctors specializing in various medical fields
- Nurses trained in the use of information technology
- Technicians who are trained in the field of IT

- Experts in other relevant medical fields.

The paper is developed with three main elements:

Element one: Provides detailed data and shows the inclusion of health information technology equipment. At this point should not be mentioned the immediate need for the application of health information technology.

The second element: The problems of using health information technology, have many benefits, but it should be noted that during the analysis of technological equipment in health, various problems may arise.

Third element: TISH in the adaptive system in medicine has the ability to adjust the speed of the result for diagnosis, but this system can present complex consequences and present new challenges for measurement and wider research. Health and equipment used in healthcare as well as in other healthcare settings is a major challenge facing many countries.

1.1 Use of medical devices using information technology

Currently, healthcare workers face vast amounts of information. The quality of medical care, the general standard of living of the population, the level of development of the country as a whole and each of its territorial subjects in health care depend on how effectively this information is used by medical staff. The age of paper information carriers is being replaced by modern information technologies that will take the work of health institutions to a qualitative level. new level, increase the work efficiency of specialist doctors and non-medical services, ensure the loyalty of medical staff and increase patient satisfaction. Informatics and information technology are most important in the professional activity of medical workers.

Information Technology applied in medical education, medical research, medical practice. Information technology includes the ability to work competently with information technology and computer.

1.2 Technological system analysis

The concept for the development of the health care system by 2020 have shown a very satisfactory result both from a practical and experimental point of view based on the data of the NIPH in Kosovo regarding the analysis and results of COVID-19 tests. According to some data from medical reports in Kosovo, the personalization of medical services such as: Electronic Health Passport (EMP), Development of ICT infrastructure of the health care system, has included some successful actions: Establishment of regional processing centers of data, Organization of electronic exchange of medical data, Establishment of national registers, reference books and classifiers, national electronic medical library Integration of all state information systems in the field of health.

1.2 Challenges related to software and hardware limitations

Physicians and other healthcare providers with information technology will be able to review a patient's complete medical history, regardless of the patient's location or provider. An individual on holiday in Brezovic who lives in Prishtina can go to any doctor and have their information available immediately. At each visit, health care providers add to the register, so no matter where and when the registration is reviewed, it will be updated in each country. Access to medical history with information technology will be available in any treatment setting: in an emergency room, in an examination room, in places around a hospital, in a doctor's home or office, in public and private clinics - wherever internet connection is available.

2.1 The necessity for a health information technology

Health Information Technology equipment is needed to record, memorize, present and send patients to different locations and may receive different opinions from physicians as well as health professionals. The technology used in healthcare can be used for the health registration system, such as patients, staff and all possible data of different

clinics or hospitals. Health information technology includes personal health tools in clinics, various application devices as well as other intelligent applications.[1,2]

2.2 Use of information technology in health

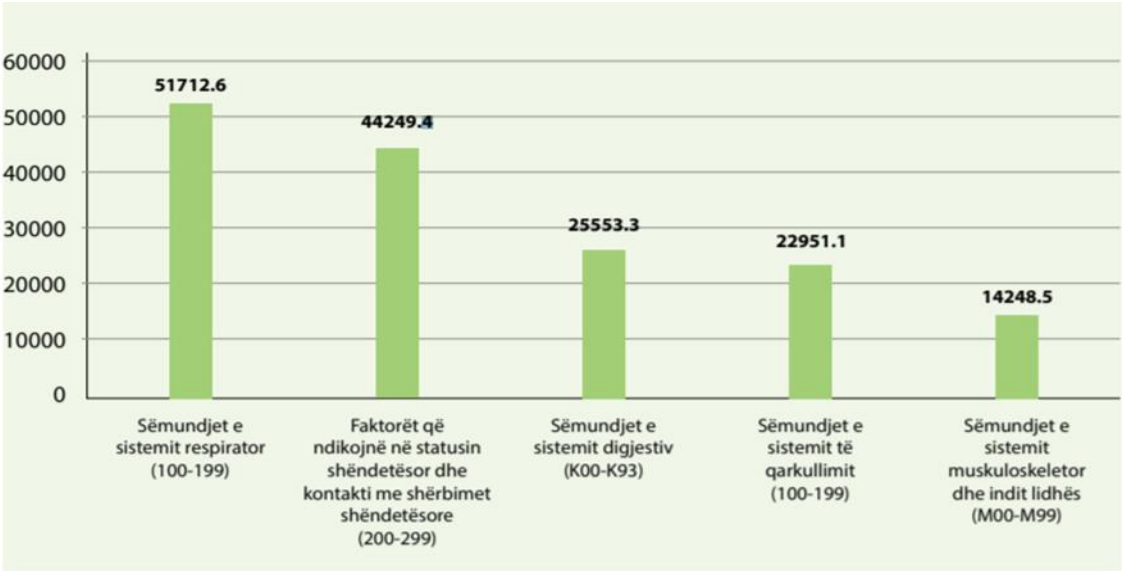
Health information technology improves various aspects of health care including quality, cost, effectiveness, accessibility etc.

- enables more information for decision making
- enables transparency and accountability for health care processes
- facilitates the provision of health care across borders
- various tests can be done and reduces errors
- improves diagnostic accuracy.
- improves access to effective care
- reduces the barriers created for the physical location
- facilitates patient empowerment for self-care and health decision-making
- facilitates the diagnosis of various diseases
- facilitates views of changes through computer imaging.
- Measurements, analyzes, examinations, correlation, change as well as the choice of various other medical problems.
- improves cost and reduces downtime and wasted time.

It is known that a computer device using information technology can not replace the human factor[3].

2.3 Health services in Kosovo

In a population analysis in Kosovo shows that the disease rate is lower and amounts to a ratio of 439 cases per 100,000 b / v, Year 2019 compared to the European Union 677 cases per 100,000 inhabitants. The most common diseases in Kosovo are various diseases such as: Digestive system, respiratory tract and others.



Graphics. 3 Number of types of diseases in Kosovo

[1] *Dr. Vijaya Pithadia, and Dr Vandana Parmar, "Renovation in Healthcare and Information technology", Faculty column, indianmba.com, 2009.*

[2] *https://tek22.weebly.com/ndikimi-i-teknologjise.html*

[3] *Arthur, W. B. (2011) Natyra e Teknologjisë: Çfarë është dhe si evoluon. New York: Shtypi i Lirë.*

During the presented analysis of the system in Kosovo is e-health which will be sufficient information for decision making. Data analyzed and diagnosed by the application of information technology in Kosovo are around 1,800.00 and annual 20,000,000 records.[4]

2.4 Introduced systems to be applied in Kosovo

These systems are being applied in the region, in Kosovo, since the data has been collected and a basic database has been formed for their implementation: e-medicines application, E-health, Health card, Computer sheets, rengenit, CT, other MRI. System for laboratories with advanced technologies.

- "Electronic Prescription" system;
- "e-Rx" system. etjera

e-barna: Regarding the e-Barna application, this application is still used by the citizens of Kosovo and is the one applied in the market. A simple, cost-free technological solution from the state data on Health care is also enabled by the e-Barna application that has access from the internet or smartphone phones, and information can be obtained for any type of drug. The purpose of this application is to improve the health status through the digitalization of the service. The newest system in the field of health is also electronic prescriptions. Teleconsultation:

The Integrated Telemedicine and e-health Program in Kosovo should equip hospitals. All sites should be equipped with technology, HD video and HD content towards quality in communication, using technology based on standards. HD monitors or video projectors are used to display the image. The main data center should be located in the Telemedicine Center in Prishtina. The Telemedicine Center in Kosovo manages the infrastructure servers and the database. The Desktop and Mobile app enables other customers to connect from their homes or offices. Infrastructure: The main telemedicine center should have a joint program: Prishtina Telemedicine Center, which is located in UCCK [5].

3.0 The main application of technology in health sciences

We all know very well that nowadays technology is everywhere, in every field or in every possible place. this advancement of technology has made our lives many times simpler and more comfortable. Finally, we can say that technology has in hand the lives of thousands of people as it occupies an important place even in medicine.

3.1 Use of technology for diagnosis

Equipping with information technology is used to diagnose various diseases whose main purpose is to identify or diagnose them as early as possible. The devices that apply information technology enable us to have current knowledge about the type of cancer, what is the course (stasis) of this disease and what it has included from the human body.

3.2 Advanced diagnostic technologies

Introducing some advanced technologies for treatment are: MRI 3 intraoperative tesla, Cyberknife, Gamma knife, Rapidarc, Trilogy, Truebeam and others.

4.0 Number of patients diagnosed with information technology equipment in Kosovo

Table: 1. Number of patients according to IT services using the radiological device

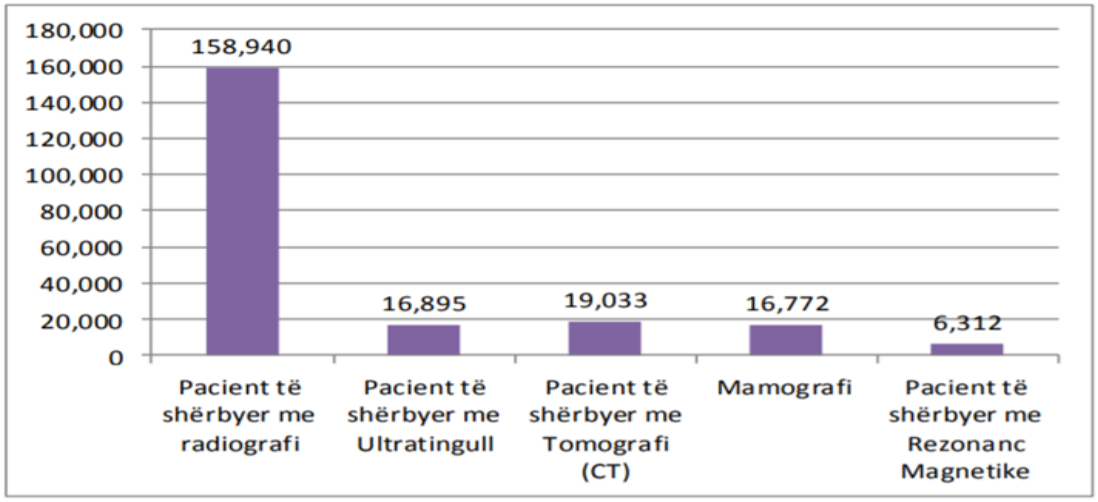
Radiology	
Diagnostic service	Number of patients diagnosed
Patients diagnosed with radiography	158,940
Ultrasound-diagnosed patients	16,895
Patients diagnosed with tomography (CT)	19,033

[4] *Future Hospital Commission. Future hospital: caring for medical patients. September 2013. Available from:http://www.rcplondon.ac.uk/sites/default/files/future-hospital-commission-report_0.pdf [Google Scholar]*

MMG-Mamografy in breast	16,772
Patients who have had magnetic resonance imaging RM	6,312
Total	217,952

Tabela: 2. Radiological services provided in Kosovo public hospitals

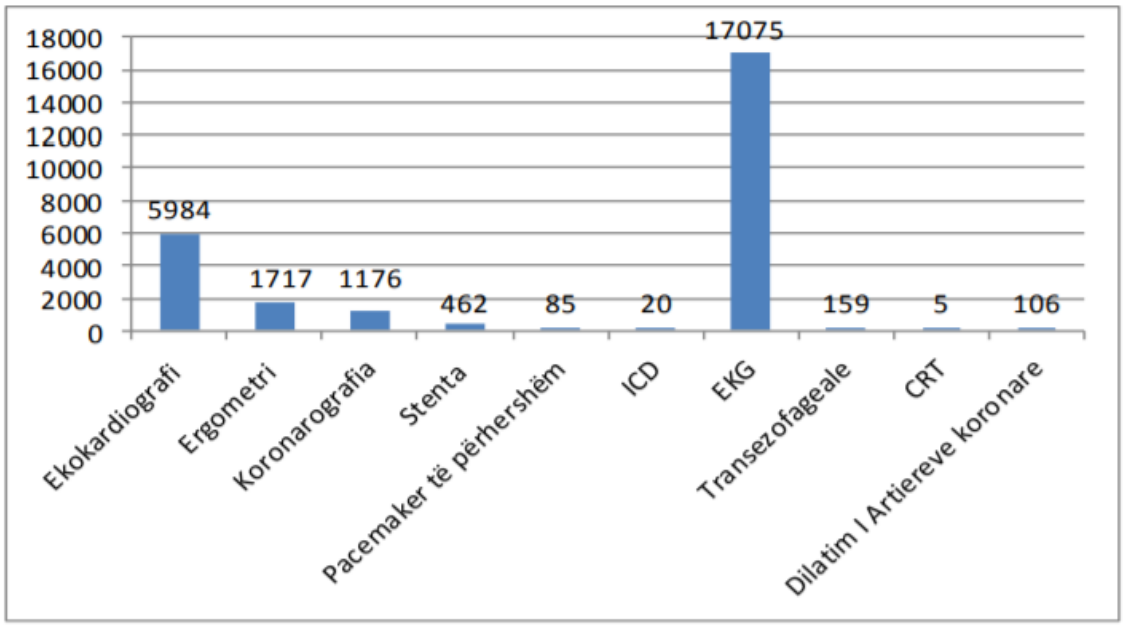
Institucione	CT-ja	MRI	Ultrasound	Radiografy	Angiografy	Mamografy	Mamografy in mobile
QKUK	19033	6312	16895	158914	96	6492	10280
Hosptal Peja	3833	-	11029	23644	-	979	-
Hosptal Prizren	3344	-	7164	24157	-	201	-
Hosptal Gjilan	1864	-	2001	10968	-	-	-
Hosptal Ferizaj	-	-	4136	4168	-	-	-
Hospital Mitrovica	834	-	1944	8186	-	117	-
Hospital Gjakovo	538	-	10776	10565	-	-	-
Hospital Vushtrri	-	-	1258	843	-	208	-
QKMP	-	-	40	1694	-	-	-
Total	29446	6312	55243	243165	69	7997	10280



Graph 3. Number of patients who have used radiology with information technology for 2021

Table: 3. Number of visits to public hospital centers in Kosovo by type of equipment during 2020

Naming the device with Information Technology	*Number of patinet*
Echocardiography device	***5984***
Ergometer device	***1717***
Coronografi device	***1176***
Stent in the heart	***472***
Permanent pacemaker	***87***
ICD	***19***
EKG	***17075***
Transesophageal services	***162***
CRT-ja	***7***
Coronographic placement and dilation	***109***



Graph: 4. Number of patients in the Department of Nephrology and Cardiology for 2021

Table: 4. Comparability by years for the use of innovative technological equipment

Krahasimi sipas viteve	*Ergometri*	*Ekokardiografi*	*Koronografi*	*Stenta*	*Pacemaker të përhershëm*	*ICD*	*EKG*	*Transezofageale*	*CRT*	*Dilatim i artieteve koronare*
11/2021	*1719*	*5979*	*1279*	*483*	*99*	*22*	*16165*	*159*	*6*	*102*
2020	*1563*	*5423*	*1000*	*361*	*75*	*29*	*14523*	*145*	*2*	*45*
2019	*1536*	*4897*	*745*	*347*	*71*	*19*	*13250*	*120*	*1*	*36*
2018	*1213*	*5348*	*740*	*320*	*56*	*15*	*12568*	*119*	*-*	*18*
Gjithësejt	*6029*	*21652*	*3661*	*1490*	*287*	*83*	*57416*	*543*	*8*	*205*

This Cardiology Clinic for 2021, has completed 1719 ergometry, 5979 echocardiography, transesophageal 167, coronarography 1279, 482 stents, 99 pacemakers, 22 ICD, 16165 ECG, 6 CRT and 102 coronary dilatations. Looking at the data as well as the records of the Cardiology Clinic at UCCK, it is seen that by using and thanking the equipment with information technology we have a very high increase in patient diagnosis. If we take compared to other years it is seen that 43.64% have more ergometry than in 2020, or expressed by the number of patients 156 more. Calculating the patients who were served with echocardiography, measurements were made about 5979 patients, or 556 more patients by 2020. Using the application of technological equipment, it is seen that we have an increase of about 18.5% or 279 more patients. Completely calculating the year 2021 we have a 54.52% increase in stents.

Tab.5. Medical services using Information Technology in HUCSK during 2021

Total service in HUCSK applying Information Technology-IT

	Number of days	Number of hospital admissions	Number of operations	Visits to QKMF	Number of laboratory patients	Patient-specific diagnostics	Number of patients with ultrasound
QKUK	492853	84896	34896	371101	1054397	851321	9641
General hospitals in Kosovo	371256	84966	21245	702626	1322543	598924	13163
Mental health	-	-	-	97410	-	87415	-
Occupational medicine	-	-	-	28120	114568	40120	-
QSKUK	-	-	-	64721	-	3146420	-
QKMS	-	-	-	16171	-	-	-
Telemedicine	-	-	-	-	-	6002	-
Total	864109	160793	56141	1280149	2485315	1859247	22804

UCCK in 2021, were 864109 days of patients cured in Kosovo with 169 862 patients who were hospitalized. In the reports of the computer sheets where we have presented them in table no. 5, shows that 56141 operations were performed in UCCK-SHSKUK. While patients in sophisticated laboratories have received services 2 491 508. In 2021 were operated patients who have used equipment with information technology 49 025 patients, 23% are as services from QKF, 48% with laboratory values as well as 34% of the total services are with special diagnostics.

Tabela: 6. Laboratory services by applying information technology equipment

Laboratory	Number of pacients	Realization of values
Biohemia	70633	490458
I Emergency	4936	287516
Surgery laboratory	35812	33245
Laboratory KOGJ-it	42786	45879
Laboatory in Pediatry	25999	28613
Laboratory in hematology	9128	11423
Laboratory in interno	23458	21989
Laboratory in interno -H	9587	9879
Infektiv	19875	19129
Laboratory in ORL-i	2219	3769
Laboratory in oftalmology	2986	4989
Laboratory in pulmology	5155	5454
Laboratory in onkologjisë	13980	13970
Laboratori i neurology	5789	5687
Laboratory in Dermatology	4989	6123
Total	277332	988123

4.1 Number of polyclinics and private dispensaries in Kosovo

Polyclinics, Clinics and private clinics have different services from different areas for the needs of patients in Kosovo, the areas in which technological equipment is used and the use of these equipment are: urology, neurology and others. All these polyclinics have a high specialist level of the above mentioned fields. One of the main problems of polyclinics in Kosovo is the purchase of equipment, as the cost of medical equipment is always very high. For example, An ultrasound diagnostic device costs $ 160,000, and a test examination device costs $ 10,000-70,000. All polyclinics can make different recordings e.g. CT, MRI, X-ray, EEG as well as with other service devices which present a sophisticated method of equipment and examinations for patients. The following is an indicative list of equipment for a private medical center: analyzer, scales, magnetic pendant, thermostat, centrifuge, water-based bath,

drying cabinet, plates with a heating surface, shakers, microscopes, equipment for measuring physical parameters, equipment for mixing, choking ovens etc.

Tabela: 7. Naming of private polyclinics and ambulances in Kosovo

Number of	*Type of institution*
1	Spitali AMERICAN HOSPITAL KOSOVA
2	Spitali BAHÇECI
3	Spitali i shërbimeve maksilofaciale ARS MEDOC
4	Spitali i oftalmologjisë KLINIKA GJERMANE E SYRIT
5	Spitali DEUTSCH FRAUENKLINIK
6	Spitali kirurgjik KAVAJA HOSPITAL
7	Spitali MENDJA INTEGRUAR MJEKËSORE
8	Spitali MEDICAL CENTER
9	Spital ONIX SPA L.L.C
10	Spital ALOKA
11	Spitali NËNA NAILE
12	Spital QENDRA LASERIKE E SYRIT KUBATI
13	Spital VITA HOSPITAL
14	Spital KLINIKA AMERICANE SH.P.K
15	Spitali KLINIKA EUROMED
16	Spital ROYAL MEDICAL
17	Spital INTERMED
18	Spital INERNATIONAL HOSPITAL
19	Spital EYE HOSPITAL Sh.P.K
20	Spitali FATI IM
21	Spitali INTERNATIONAL MEDICINE HOSPITAL
22	Spitali AKAT SH.P.K
23	Spitali LINDJA
24	Spitali SIRONA
25	Spitali INTERNATIONAL HOSPITAL

In the following we present the activities of private hospitals using Information-IT technology

Table: 8. Activity of polyclinics and clinics in Kosovo with Information Technology equipment

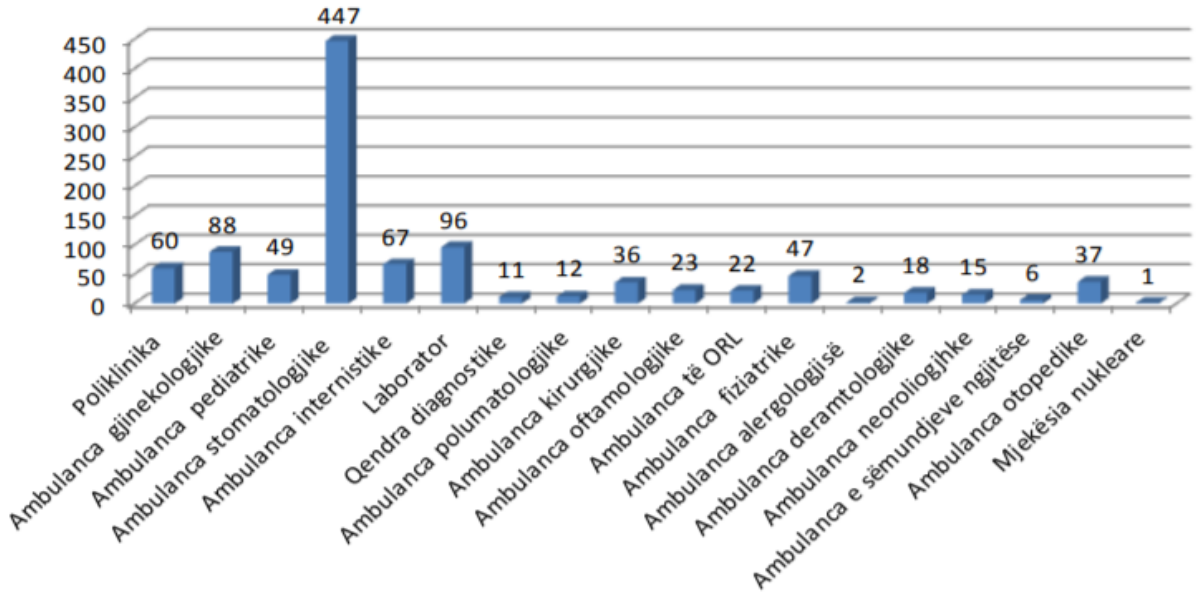
Spitalet dhe aktivitetet e tyre	*Numri i spitaleve*	*Numri i specialistëve*	*Numri i infermiereve*	*Numri per pacient*
General Hospital	2	83	138	72
Daily hospital	5	21	42	28
Special ophthalmology hospital	2	12	24	20
Special Hospital for Cardiovascular Diseases	2	10	18	20
Special Hospital for Gynecology, Infertility and Endocrinology	6	50	104	66
Special hospital for general rehabilitation	2	20	27	49
Urology Hospital	2	3	7	11
Ortopedi Hospital	3	18	34	25
Surgery Hospita	2	29	55	40
Total	26	246	449	331

Public institutions that serve in Kosovo are better equipped with more sophisticated technological equipment than private ones, when it is known that the number of private polyclinics in Kosovo are about 1,071 which serve in private health institutions and only 30 of them provide outpatient services. The number of polyclinics and ambulances which apply information technology for control and diagnosis of various diseases are presented in table no.9.[6] [7]

Tabela: 9. Number of polyclinics and ambulances that apply IT

Health institution that applies IT	Total
Polyclinic service	62
Specialized gynecological ambulances	90
Pediatric specialist ambulances	50
Stematological ambulances	450
Specialist internal medical ambulance	68
Laboratore të ndryshme	98
Other diagnostic centers	12
Other pulmatological ambulances	11
Specialist surgical ambulances	35
Ophthalmic eye ambulances	24
Ambulances ORL-s	23
Physiotherapy ambulances with physiatrists	48
Allergy specialist clinics	3
Ambulances dermatology	19
Ambulances neurology	16
Infectious disease specialist clinics	7
Ambulances ortopedik	37
Total	1053

There are 1053 specialist clinics, it can be seen that 28.5% of them apply sophisticated technological equipment such as dental clinics



[6] *Ligji i Shëndetësisë, Nr.04/L-125 32 Master plan, BB, 2008*
[7] *Analiza e performances së sektorit shëndetësor 2012*

Graph 5. Licensed private health institutions that apply Information technology

4.2 High level technology in medicine in the Private Sector in Kosovo

Today, people are accustomed to using old equipment and tools without noticing scientific and technological advances. Kosovo has not invested in the renovation and purchase of medical equipment during 2021, especially equipment that uses sophisticated information technology.

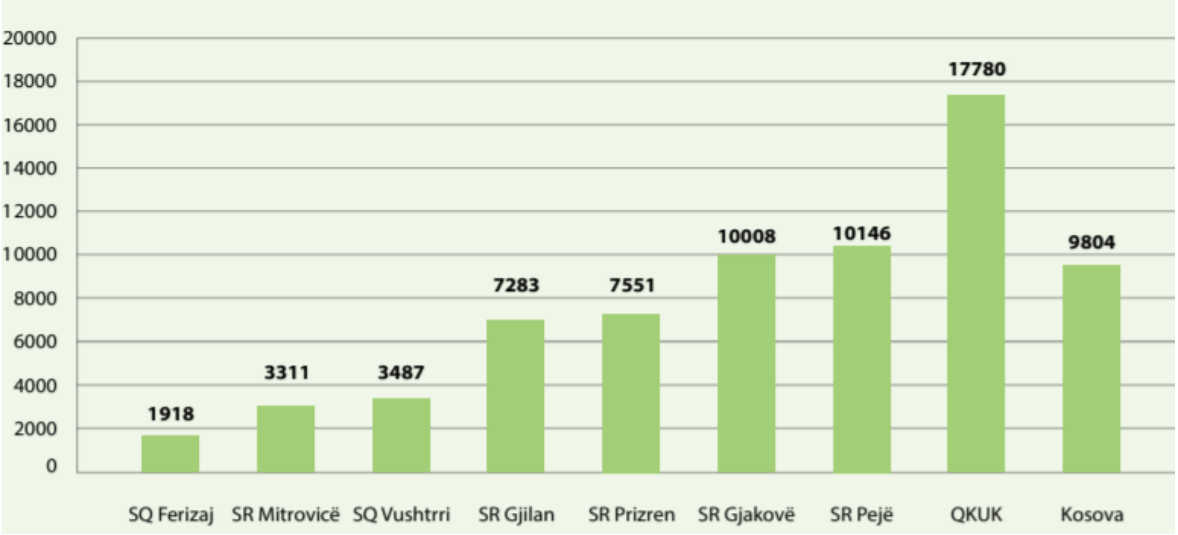
Whereas the number of devices that apply information technology are: 5 information technology devices of the Republic of Macedonia (3 in the private sector); 20 CT tomography equipment (8 in the private sector), 8 mammography IT equipment (3 in the private sector).

The Clinical Center during 2019, has performed 350 magnetic resonance imaging-RM diagnoses, increasing to 3,015 in 2020 and 3,990 in 2021. The number of CTs is presented in Table 10.

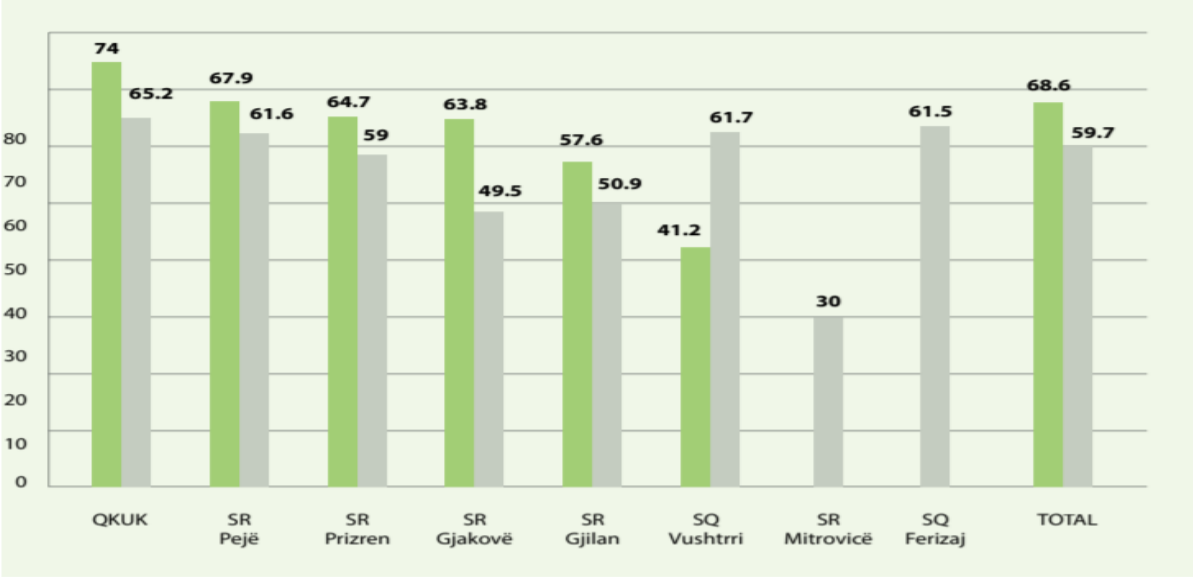
Tabela 10. Number of CTs in the period 2015-2021 in the public sector

Device naming	2015	2016	2017	2018	2019	2020	2021
IT CT-innovation device	5	5	8	9	10	12	14
Total patient-procedures	13125	13125	18290	19432	20432	22019	24206
CT procedures for each device	4375	4375	2286	2159	2213	2315	2450

Comparing EU countries, Kosovo has not purchased RM and CT equipment. Today in Kosovo and in the EU country more than 58% of all patients consult their family doctor. In Kosovo, the WHO standard has not reached that 70-80% apply diagnostic notifications through their personal doctor and using Information technology.



Graph 6. The rate and number of patients from the hospital per 100,000 inhabitants, who have applied the Information technology device for diagnosis.



Graph 7. Average days of usability of beds and equipment with information technology in public hospitals in Kosovo for diagnosis from 2015 to 2021.

During 2021, more than 50,551 people were checked and diagnosed with various diseases with operations in which they used information technology, ie 35.1% in public hospitals and 65.1% in public hospitals. Whereas in 2020, 25,601 operations were completed in Kosovo, where 43.2% in private hospitals and 66.8% in public hospitals. The total amount performed for patients admitted to private hospitals and who have applied information technology is 18.9 in UCCK, while 11.9 and 14.8 in all hospitals. And in 2019 there was an increase in UCCK clinics.

Conclusion

Nowadays it is intended to apply in Kosovo various application devices with information technology which are useful for Kosovar patients, as a concept by Kosovar programmers and with the initiative of the Government of the Republic of Kosovo respectively the Ministry of Health it is necessary that to form several different types of registers such as: EHR / EHCR (Electronic Health Records), PCR (Patient Registration System), CMR (Computerized Treatment), CPR (Computer-Based Patient Registers), EPR (Registers Electronic Patient Records), EMR (Electronic Medical Records), PHR (Personal Health Records)

Based on an analysis, it is seen that the use of information technology in Kosovo for a year is 1434 patients and is always increasing, where all patients are diagnosed and examined with information technology in public hospitals.

In all public and private hospitals are widely presented programmed information technologies, modular, based on patient problems, based on state projects, which creates the necessary scientific basis for solving patients' problems and the design of technologies for professional activity. medical. The introduction of new information technologies in Kosovo such as paracentric learning technology, technology of full assimilation of basic knowledge for doctors, technology of individual learning, technology of collaborative learning, significantly changed the level of health and development of a country.Based on a tireless work in which the master thesis has been worked I can emphasize that patients are very satisfied with the information technology services more than 70% are satisfied and many are satisfied with the medical staff and the support they received in public institutions, while the private sector was very satisfied with the service but the remark was that the prices offered were high.

Therefore, I can emphasize and recommend the Minister of Health of the Republic of Kosovo that a long-term strategy is needed for the health of patients in Kosovo and to take care of health insurance because a healthy population means a genuine and stable state.

References

Cyrille Delpierre, Lise Cuzin, Judith Fillaux, Muriel Alvarez, Patrice Massip and Thierry Lang (2004). “A systematic review of computer- based patient record systems and quality of care: more randomized clinical trials quality of care: more randomized clinical trials or a border approach”, International Journal for Quality in Health Care.

J.G. Proakis and D.G. Manolakis (2003). – Digital Signal Processing – Principles, Algorithms and Aplications Third Edition; Prentice Hall of India.

Dr. Vijaya Pithadia, and Dr Vandana Parmar (2009). “Renovation in Healthcare and Information technology”, Faculty Column, India.

Chaudhry B, Wang J, Wu S. (2006). "Systematic review: Impact of health information technology on quality, efficiency, and costs of medical care". Annals of Internal Medicine.

Hart, A. D., & Frejd, S. H. (2013). Pushtimi dixhital: Si po ju formon teknologjia dhe marrëdhëniet tuaja. Grand Rapids: Baker Books.

Gawande A. (2011). The checklist manifesto: how to get things right. New York: Picador USA.

Bates, D. W., Cohen, M., Leape, L. L., & Overhage, J. M. (2001). Reduktimi i frekuencës së gabimeve në mjekësi duke përdorur teknologjinë e informacionit.

Dr. Md. Kamal Hussain, PhD, Dr. Ahmad Omar Babalghith, PhD HEALTH INFORMATION MANAGEMENT & TECHNOLOGY: A NEW ERA OF TRANSFORMING HEALTHCARE 2013.