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I affirm that this PhD Thesis is solely the product of my own efforts. In instances where any content may appear to be the work of others, I have provided complete citations and references, along with appropriate acknowledgements.

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Περίληψη

Τα Συστήματα Πληροφοριών Υγείας (HIS) έχουν υποστεί σημαντική εξέλιξη από την ίδρυσή τους στα μέσα του 20ού αιώνα. Τα συγκεκριμένα συστήματα έχουν διαδραματίσει καθοριστικό ρόλο στον εκσυγχρονισμό της υγειονομικής περίθαλψης, καθοδηγούμενα από τεχνολογικές προόδους και από την ανάγκη για αποτελεσματική και αποδοτική παροχή υγειονομικής περίθαλψης. Η παρούσα μελέτη εξετάζει την ιστορική ανάπτυξη, την τρέχουσα κατάσταση και τις μελλοντικές προοπτικές των HIS, με έμφαση στις προκλήσεις και τα οφέλη που συνδέονται με την εφαρμογή και τις χρήσεις τους.

Η ανάπτυξη των HIS διακρίνεται σε αρκετές βασικές φάσεις. Η αρχική φάση, κατά τις δεκαετίες του 1960 και του 1970, επικεντρώθηκε κυρίως σε διοικητικές λειτουργίες. Τα HIS σε αυτό το στάδιο στόχευαν στη μετατροπή των χάρτινων αρχείων σε ηλεκτρονικές φόρμες για να βελτιώσουν την αποδοτικότητα και την ακρίβεια. Αυτά τα πρώιμα συστήματα παρείχαν στοιχειώδεις ηλεκτρονικές δυνατότητες αποθήκευσης που μείωναν τις λογιστικές πολυπλοκότητες που συνδέονται με τα χάρτινα αρχεία. Τη δεκαετία του 1980 και του 1990, η εισαγωγή των Ηλεκτρονικών Φακέλων Υγείας (EHR) αποτέλεσε σημαντική πρόοδο. Οι EHR προχώρησαν πέρα από την απλή ψηφιοποίηση, προσφέροντας ολοκληρωμένα και διαλειτουργικά συστήματα που ενσωμάτωναν μια ευρύτερη γκάμα δεδομένων ασθενών. Αυτή η εποχή βίωσε την εξέλιξη των EHR από απλά ψηφιακά αρχεία σε προηγμένα συστήματα που επέτρεπαν την απρόσκοπτη πρόσβαση σε πληροφορίες ασθενών μεταξύ διαφορετικών τμημάτων και ιδρυμάτων, προωθώντας έτσι τη συνεχή και ολοκληρωμένη παροχή υγειονομικής περίθαλψης.

Η δεκαετία του 2000 έδωσε έμφαση στην ολοκλήρωση και τη διασυνδεσιμότητα. Πολιτικές όπως ο Νόμος για την Οικονομική και Κλινική Υγεία (HITECH) στις Ηνωμένες Πολιτείες παρείχαν κίνητρα για την υιοθέτηση των HIS, οδηγώντας σε σημαντική αύξηση της χρήσης των EHR. Κατά τη διάρκεια αυτής της περιόδου, τα HIS άρχισαν να ενσωματώνουν προηγμένες λειτουργίες όπως τα συστήματα υποστήριξης αποφάσεων, οι ειδοποιήσεις φαρμάκων και η παρακολούθηση ασθενών. Στη δεκαετία του 2010 και μετά, η ενσωμάτωση των Μεγάλων Δεδομένων (Big Data) και της Τεχνητής Νοημοσύνης (AI) μεταμόρφωσε τα HIS σε δυναμικά εργαλεία για τη λήψη κλινικών αποφάσεων. Αυτές οι προόδοι μετέτρεψαν τα HIS από παθητικές αποθήκες δεδομένων σε ενεργούς συμμετέχοντες στην παροχή υγειονομικής περίθαλψης. Τα σύγχρονα HIS διαθέτουν πλέον τη δυνατότητα να προβλέπουν την επιδείνωση των ασθενών, να προσαρμόζουν τα θεραπευτικά σχέδια και να ανιχνεύουν

μελλοντικές επιδημίες μέσω εξελιγμένης ανάλυσης δεδομένων και αλγορίθμων μηχανικής μάθησης.

Τα σύγχρονα HIS χαρακτηρίζονται από ευρεία υιοθέτηση, την επιδίωξη της διαλειτουργικότητας, την έμφαση στην κεντροθετημένη στον ασθενή φροντίδα και τη χρήση μεγάλων δεδομένων. Αυτά τα συστήματα έχουν γίνει αναπόσπαστα συστατικά των υποδομών υγειονομικής περίθαλψης παγκοσμίως, ώστε να συναντώνται από αγροτικές κλινικές πρωτοβάθμιας φροντίδας μέχρι αστικά πολυ-ειδικότητας νοσοκομεία. Η ενσωμάτωση των HIS στα περιβάλλοντα υγειονομικής περίθαλψης έχει καθοδηγηθεί από κυβερνητικές εντολές, οικονομικά κίνητρα και αποτελέσματα βασισμένα σε αποδείξεις. Η διαλειτουργικότητα παραμένει μια κρίσιμη ανάγκη στο σύγχρονο τοπίο των HIS. Η ικανότητα των διαφορετικών συστημάτων να επικοινωνούν και να ανταλλάσσουν πληροφορίες χωρίς προβλήματα είναι ζωτικής σημασίας για την παροχή συνεπούς και υψηλής ποιότητας φροντίδας. Τα τυποποιημένα πρωτόκολλα, όπως το Health Level Seven (HL7) και οι Fast Healthcare Interoperability Resources (FHIR), υιοθετούνται όλο και περισσότερο για να διασφαλιστεί ότι τα HIS μπορούν να λειτουργούν σε διαφορετικές πλατφόρμες.

Η μετάβαση προς την κεντροθετημένη στον ασθενή φροντίδα έχει επίσης διευκολυνθεί από τα HIS. Οι πύλες ασθενών, οι πλατφόρμες τηλεϊατρικής και οι φορητές συσκευές που ενσωματώνονται στα HIS παρέχουν τη δυνατότητα στους ασθενείς να έχουν πρόσβαση στα ιατρικά τους αρχεία, να συμμετέχουν σε απομακρυσμένες διαβουλεύσεις και να παρακολουθούν την υγεία τους σε πραγματικό χρόνο. Αυτή η μετάβαση αντιπροσωπεύει μια νέα εποχή στην υγειονομική περίθαλψη όπου οι ασθενείς είναι ενεργοί συμμετέχοντες στις διαδικασίες φροντίδας τους. Τα Μεγάλα Δεδομένα και η Τεχνητή Νοημοσύνη έχουν εισαγάγει τόσο ευκαιρίες όσο και προκλήσεις για τα HIS. Η διάδοση ψηφιακών συσκευών και αισθητήρων έχει οδηγήσει σε μια έκρηξη δεδομένων που σχετίζονται με την υγεία. Ενώ αυτά τα δεδομένα έχουν τεράστιο δυναμικό για τη βελτίωση των αποτελεσμάτων της υγειονομικής περίθαλψης, παρουσιάζουν επίσης προκλήσεις που σχετίζονται με την ασφάλεια δεδομένων, την ιδιωτικότητα και τις ηθικές εκτιμήσεις. Τα ρυθμιστικά πλαίσια όπως ο Γενικός Κανονισμός για την Προστασία Δεδομένων (GDPR) στην Ευρώπη και ο Νόμος για τη Φορητότητα και Λογοδοσία της Ασφάλισης Υγείας (HIPAA) στις Ηνωμένες Πολιτείες εξελίσσονται συνεχώς για να αντιμετωπίσουν αυτές τις πολυπλοκότητες.

Αυτή η μελέτη εξετάζει αρκετά κρίσιμα ερευνητικά ερωτήματα. Ερευνά την ιστορική εξέλιξη των HIS και τους βασικούς παράγοντες που επηρεάζουν την ανάπτυξή τους. Παρουσιάζει τα εμπόδια που αντιμετωπίζουν οι οργανισμοί υγειονομικής περίθαλψης στην

εφαρμογή των HIS και εξετάζει πώς αυτά τα συστήματα επηρεάζουν τη λήψη κλινικών αποφάσεων και τα αποτελέσματα των ασθενών. Η μελέτη αξιολογεί επίσης τις αντιλήψεις των επαγγελματιών υγείας για τα HIS και αναλύει τα νομικά και ηθικά πλαίσια που επηρεάζουν τον σχεδιασμό και την εφαρμογή αυτών των συστημάτων. Ο στόχος της έρευνας είναι να παράσχει μια ολοκληρωμένη κατανόηση των πολυδιάστατων δυναμικών των HIS εξετάζοντας τις τεχνολογικές λεπτομέρειες, τις δυναμικές των χρηστών και το ευρύτερο πλαίσιο της υγειονομικής περίθαλψης. Παράλληλα, η μελέτη υιοθετεί μια ποσοτική ερευνητική μεθοδολογία, χρησιμοποιώντας δομημένα ερευνητικά εργαλεία και στατιστική ανάλυση για τη συλλογή και ερμηνεία δεδομένων από επαγγελματίες υγείας σχετικά με τις εμπειρίες και τις αντιλήψεις τους για τα HIS.

Επίσης στη μελέτη προβάλλονται σημαντικές και πρωτότυπες πληροφορίες σχετικά με την εξέλιξη των HIS, υπογραμμίζοντας τον κρίσιμο ρόλο των τεχνολογικών προόδων, τις προκλήσεις επίτευξης διαλειτουργικότητας και τη σημασία της αποδοχής και της εκπαίδευσης των χρηστών. Διαπιστώθηκε ότι τα HIS έχουν ουσιαστική επίδραση στη λήψη κλινικών αποφάσεων και στα αποτελέσματα των ασθενών, ιδιαίτερα σε περιβάλλοντα με υψηλά επίπεδα αποδοχής από τους χρήστες. Η εξέλιξη των HIS στην Ελλάδα αποτελεί μια μελέτη περίπτωσης που αντικατοπτρίζει τις παγκόσμιες τάσεις. Οι αρχικές προσπάθειες στα τέλη της δεκαετίας του 1980 και του 1990 επικεντρώθηκαν στα διοικητικά συστήματα, ενώ ακολούθησε η υιοθέτηση των EHR στη δεκαετία του 2000. Οι πρόσφατες εξελίξεις στην Ελλάδα δίνουν έμφαση στη χρήση μεγάλων δεδομένων και τεχνητής νοημοσύνης για τη βελτίωση της παροχής υγειονομικής περίθαλψης, παρά τις προκλήσεις που θέτουν οι οικονομικοί περιορισμοί και η αντίσταση από τους επαγγελματίες υγείας.

Τα ευρήματα υπογραμμίζουν την αναγκαιότητα συνεχών επενδύσεων στα HIS, με έμφαση στη διαλειτουργικότητα, την ασφάλεια δεδομένων και την εκπαίδευση των χρηστών. Οι μελλοντικές έρευνες θα πρέπει να εξετάσουν το δυναμικό των αναδυόμενων τεχνολογιών, όπως η τεχνητή νοημοσύνη και η ανάλυση μεγάλων δεδομένων, για την περαιτέρω μεταμόρφωση και μετεξέλιξη των HIS. Η επιτυχής εφαρμογή των HIS απαιτεί την αντιμετώπιση τεχνικών, οργανωτικών και ηθικών προκλήσεων. Τα Συστήματα Πληροφοριών Υγείας είναι καθοριστικά για τον εκσυγχρονισμό της παροχής υγειονομικής περίθαλψης, προσφέροντας σημαντικά οφέλη σε ό,τι αφορά την αποδοτικότητα, την ακρίβεια και τα αποτελέσματα των ασθενών. Ωστόσο, η επιτυχής εφαρμογή τους απαιτεί μια ολιστική προσέγγιση που αντιμετωπίζει τεχνικές, οργανωτικές και ηθικές προκλήσεις.

Επιλογικά, η παρούσα μελέτη παρέχει μια ολοκληρωμένη κατανόηση της εξέλιξης και της επίδρασης των HIS, προσφέροντας πρωτογενείς πληροφορίες, χρήσιμες πρωτίστως για τους υπεύθυνους χάραξης πολιτικής, τους επαγγελματίες υγείας και τους ερευνητές. Με την ανάδειξη της ιστορικής εξέλιξης, του σύγχρονου πλαισίου και των μελλοντικών προοπτικών των HIS, αυτή η έρευνα συμβάλλει στη συνεχιζόμενη συζήτηση για τη βελτιστοποίηση της παροχής υγειονομικής περίθαλψης μέσω προηγμένων συστημάτων πληροφόρησης.

Abstract

Health Information Systems (HIS) have undergone substantial development since its establishment in the mid-20th century. These systems have been crucial in the modernization of healthcare, propelled by technological breakthroughs and the need for streamlined and successful healthcare delivery. This paper examines the past, present, and future of HIS, with a particular emphasis on the difficulties and advantages linked to their adoption and use.

The evolution of Health Information Systems (HIS) can be categorized into distinct phases. The initial phase, spanning the 1960s and 1970s, mostly concentrated on administrative responsibilities. At this stage, the objective of HIS was to transform physical records into digital representations in order to improve efficiency and precision. These initial systems offered basic electronic storage capabilities that reduced the logistical challenges related to paper data. The use of Electronic Health Records (EHRs) in the 1980s and 1990s represented a notable progress. Electronic Health Records (EHRs) surpassed mere digitization by providing all-encompassing and interoperable systems that seamlessly incorporated a broader spectrum of patient information. During this period, electronic health records (EHRs) advanced from basic digital records to complex systems that facilitated effortless retrieval of patient information across many departments and institutions. This advancement promoted the provision of continuous and integrated healthcare services.

The 2000s placed a strong emphasis on the integration and interconnectedness of many elements. The implementation of policies like the Health Information Technology for Economic and Clinical Health (HITECH) Act in the United States has offered incentives to encourage the adoption of Health Information Systems (HIS), leading to a substantial rise in the utilization of Electronic Health Records (EHRs). During this time, HIS started integrating advanced features like decision support systems, medication warnings, and patient tracking. During the 2010s and beyond, the integration of Big Data and Artificial Intelligence (AI) revolutionized Health Information Systems (HIS) into powerful tools for making clinical decisions. These improvements transformed health information systems (HIS) from being passive data repositories to actively participating in healthcare delivery. Contemporary healthcare information systems now have the ability to anticipate patient decline, customize treatment strategies, and identify upcoming outbreaks using advanced data analysis and machine learning algorithms.

Contemporary Health Information Systems (HIS) are distinguished by their extensive implementation, the goal of achieving interoperability, a strong emphasis on patient-centered treatment, and the application of large-scale data analysis. These systems are now essential elements of healthcare infrastructures worldwide, ranging from rural basic care clinics to large multi-specialty hospitals. The incorporation of Health Information Systems (HIS) into healthcare environments has been propelled by government directives, monetary incentives, and outcomes supported by empirical research. Interoperability is still an essential requirement in the modern environment of Health Information Systems (HIS). Seamless communication and information exchange between multiple systems are crucial for delivering consistent and high-quality treatment. Healthcare Information Systems (HIS) are increasingly utilizing standardized protocols, such as Health Level Seven (HL7) and Fast Healthcare Interoperability Resources (FHIR), to ensure seamless operation across various platforms.

HIS has also played a role in enabling the transition to patient-centered care. By integrating patient portals, telemedicine platforms, and wearable devices with the hospital information system (HIS), patients are empowered to conveniently access their medical records, participate in remote consultations, and monitor their health in real-time. This transition signifies a paradigm shift in healthcare, as individuals assume an active role in their care procedures. The advent of Big Data and AI has brought out both prospects and obstacles for Health Information Systems (HIS). The widespread adoption of digital devices and sensors has resulted in a significant increase of health-related data. Although this data has great potential for enhancing healthcare outcomes, it also poses issues with data security, privacy, and ethical considerations. The General Data Protection Regulation (GDPR) in Europe and the Health Insurance Portability and Accountability Act (HIPAA) in the United States are constantly developing to deal with these intricacies.

This study aims to investigate numerous crucial research inquiries. This study examines the historical evolution of HIS (Health Information Systems) and the significant elements that have shaped their growth. This text delves into the challenges that healthcare organizations have while deploying Health Information Systems (HIS) and analyzes the influence of these systems on clinical decision-making and patient outcomes. The study evaluates the perspectives of healthcare professionals regarding Health Information Systems (HIS) and examines the impact of legal and ethical frameworks on the development and deployment of these systems. The research seeks to gain a thorough comprehension of the complex and diverse dynamics of Health Information Systems (HIS) by analyzing the intricate technology

aspects, user behaviors, and the wider healthcare environment. This study employs a quantitative research technique, using structured research instruments and statistical analysis to collect and analyze data from healthcare professionals regarding their experiences and perceptions of Health Information Systems (HIS).

The study provided valuable insights into the development of Health Information Systems (HIS), highlighting the pivotal role of technology progress, the difficulties in attaining interoperability, and the significance of user acceptability and training. Health information systems (HIS) were discovered to have a significant influence on the process of making clinical decisions and the results experienced by patients, especially in settings where there is a high level of acceptability by users. The development of Health Information Systems (HIS) in Greece provides as a case study that mirrors worldwide patterns. The initial endeavors in the late 1980s and 1990s were mostly directed towards administrative systems, which were subsequently succeeded by the implementation of Electronic Health Records (EHRs) in the 2000s. Greece is currently focusing on using big data and AI to improve healthcare, even though they face obstacles such as economic limits and opposition from healthcare experts.

The results emphasize the need for continuous investment in Health Information Systems (HIS), with a particular emphasis on ensuring interoperability, data security, and user training. Subsequent investigations should investigate the capacity of nascent technologies, such as artificial intelligence and big data analytics, to further revolutionize health information systems. To achieve the successful implementation of a Health Information System (HIS), it is necessary to tackle technological, organizational, and ethical obstacles. Health Information Systems play a crucial role in updating healthcare delivery, providing substantial advantages in terms of effectiveness, precision, and patient results. Nevertheless, the effective execution of these initiatives requires a thorough strategy that tackles technical, organizational, and ethical obstacles. This paper offers a comprehensive analysis of the development and influence of Health Information Systems (HIS), providing significant insights for policymakers, healthcare professionals, and researchers. This research enhances the ongoing discussion on improving healthcare delivery using advanced information systems by examining the historical development, current situation, and future possibilities of HIS.

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Konstantinos Milioris

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Chapter 1

1. Introduction:

The healthcare sector, an essential cornerstone in advancing societal well-being, has undergone noteworthy transformations in recent decades. The emergence and evolution of Health Information Systems (HIS) play a crucial role in this transition. The complexity of healthcare delivery is escalating due to the rise in diseases and advancements in medical knowledge. Consequently, there is an urgent need for information systems that are resilient, efficient, and inventive. This chapter provides an in-depth analysis of the historical context, current state, and underlying necessities for a comprehensive examination of Health Information Systems (HIS) in the modern healthcare environment.

When examining the genealogy of Health Information Systems (HIS), a complex narrative emerges, intricately entwined with advancements in technology, changing healthcare models, and the continuously increasing requirements of patients. From basic methods of preserving records to advanced decision-support systems powered by artificial intelligence, health information systems (HIS) have emerged as the fundamental infrastructure supporting the operations of contemporary healthcare. However, similar to every substantial technological advancement, this shift is marked by obstacles, discussions, and critical junctures of decision-making.

This chapter aims to provide a comprehensive understanding of the origins of Health Information Systems (HIS), their evolution over time, the current issues they face, and the underlying reasons that highlight the importance of this research endeavor. In this investigation, the chapter establishes the foundation for the following sections of the study, providing readers with a comprehensive overview of the field of Health Information Systems (HIS) and its inherent significance in the present era.

1.1. Historical Context

In order to fully comprehend the significant ramifications of Health Information Systems (HIS) within the contemporary healthcare landscape, it is necessary to undertake a retrospective exploration, following the developmental path of these systems from their early stages to their present state of advanced complexity.

1.1.1. The Emergence of Health Information Systems: 1960s-1970s

The nascent stages of HIS were observed during the latter part of the 1960s and the early years of the 1970s. The aforementioned systems were predominantly designed to address administrative functions, specifically by providing rudimentary electronic storage capabilities in order to alleviate the logistical complexities associated with paper-based data. The primary objective was straightforward: to convert patient records into a digital format in order to enhance efficiency and precision. Institutions such as Massachusetts General Hospital initiated studies involving the initial iterations of Electronic Medical Records (EMRs) with the objective of optimizing administrative procedures.

1.1.2. The Emergence and Advancement of Electronic Health Records (EHRs): 1980s-1990s

During the 1980s, there was an increasing acknowledgment of the potential of electronic systems in augmenting the quality of patient care. Electronic Health Records (EHRs) have evolved to be distinct from Electronic Medical Records (EMRs) by providing more advanced functionalities. EHRs go beyond simply digitizing paper records and instead offer complete and interoperable systems that incorporate a wider range of patient data. The objective was to establish a system that would enable the smooth and efficient access of patient information across several medical departments or even institutions, hence promoting the uninterrupted provision of healthcare services.

1.1.3. The Epoch of Integration and Interconnectivity: The 2000s

The onset of the 21st century witnessed a transition towards a more comprehensive and interconnected methodology. Due to technology improvements, Health Information Systems (HIS) have demonstrated capabilities that extend beyond basic record-keeping functions. Currently, systems are equipped with functionalities such as decision help, medication warnings, and patient tracking. The usage of electronic health records (EHRs) in healthcare facilities experienced a significant increase due to the implementation of the Health Information Technology for Economic and Clinical Health (HITECH) Act in the United States. This act provided incentives for the integration of health information systems (HIS) within the healthcare sector.

1.1.4. The Emergence of Big Data and Artificial Intelligence: 2010s-Present

The field of Health Information Systems (HIS) has undergone a significant transformation in the last ten years due to the rapid advancement and widespread adoption of data-driven technologies. The integration of artificial intelligence, machine learning, and predictive analytics has revolutionized these systems, shifting them from inert warehouses of data to dynamic contributors in clinical decision-making processes. In contemporary healthcare, Health Information Systems (HIS) provide the capability to accurately predict patient deterioration, provide tailored treatment plans, and effectively detect future epidemics.

The evolution of Health Information Systems (HIS), from its initial primitive form to its present intricate state, highlights its pivotal significance in the transformative process of healthcare. In light of the increasing prevalence of data-driven insights, artificial intelligence, and customized medicine, it is crucial to comprehend the historical context in order to properly navigate the forthcoming period.

1.2. Contemporary Context

To effectively navigate the current landscape of Health Information Systems (HIS), it is essential to possess a comprehensive understanding that extends beyond the technical aspects. This understanding should incorporate socio-political, economic, and organizational elements. The present state of Health Information Systems (HIS) is characterized by a multifaceted composition, shaped by a variety of involved parties, swift technical progress, and changing healthcare priorities.

1.2.1. Prevalence of Health Information System Adoption

In the present day, Health Information Systems (HIS) have transitioned from being optional additions to becoming essential components of healthcare infrastructures on a global scale. Health information systems (HIS) platforms are widely prevalent throughout various healthcare settings, ranging from primary care clinics situated in rural areas to multi-specialty hospitals located in urban environments. The adoption of various measures, such as governmental mandates, fiscal stimulants, and evidence-based outcomes, has been widely observed in industrialized nations due to the incentives provided. In the context of developing economies, it is apparent that there is a discernible trend towards enhanced integration of Health Information Systems (HIS). This trajectory is propelled by a combination of local endeavors and global health priorities, notwithstanding the presence of ongoing hurdles.

1.2.2. The Quest for Interoperability

Interoperability stands as a prominent necessity within the contemporary environment of Health Information Systems (HIS). Healthcare professionals acknowledge the importance of implementing integrated systems that facilitate smooth communication, hence promoting consistent delivery of care and mitigating the occurrence of medical errors. Standardized protocols, such as Health Level Seven (HL7) and Fast Healthcare Interoperability Resources (FHIR), are increasingly being adopted with the objective of establishing a universally understood language for Health Information Systems (HIS) across diverse platforms.

1.2.3. The Significance of Patient-Centered Care in the Context of Health Information Systems (HIS)

The increased accessibility of information has led to a greater level of patient engagement and knowledge in healthcare. The utilization of patient portals, telemedicine platforms, and wearable devices integrated with health information systems (HIS) has provided patients with enhanced capabilities, enabling them to access their medical records, engage in remote consultations, and engage in real-time health monitoring. This transition signifies the advent of a novel epoch in which healthcare is characterized by collaboration, as patients assume an active role in the decision-making processes.

1.2.4. The Potential and Complexity of Big Data

The proliferation of digital devices and sensors, both in clinical settings and everyday situations, has resulted in a significant increase of health-related data. The abundance of data in this context presents both opportunities and obstacles. The primary difficulties that HIS stakeholders are currently grappling with include data security, privacy concerns, and ethical dilemmas.

1.2.5. The Dynamic Nature of Regulatory and Ethical Frameworks

The increasing importance of Health Information Systems (HIS) has led regulatory bodies worldwide to face challenges in developing frameworks that effectively address patient safety, data security, and ethical data utilization. The regulatory framework is continuously adapting to address the distinctive complexities posed by contemporary Health Information Systems (HIS), ranging from the General Data Protection Regulation (GDPR) in Europe to the Health Insurance Portability and Accountability Act (HIPAA) in the United States.

In summary, the present landscape of health information systems (HIS) is marked by swift progress, evolving paradigms, and intricate obstacles. As the integration of these systems becomes increasingly ingrained in the provision of healthcare, it becomes crucial for all parties concerned to comprehend their intricacies, possibilities, and drawbacks.

1.3. Justification for the Research

The examination of the complexities of Health Information Systems (HIS) is not solely a scholarly pursuit, but rather a crucial undertaking within the framework of our swiftly developing healthcare environment. The justification for doing this study is complex, as it encompasses both the historical development and the potential consequences of health information systems (HIS) in the context of global healthcare.

1.3.1. Mitigating Present Challenges in Health Information Systems

Health information systems (HIS) have significantly transformed the delivery of healthcare services; nonetheless, they are not exempt from encountering various obstacles. Persistent challenges exist in the domains of interoperability, data security, user resistance, and ethical considerations. There exists an urgent demand for comprehensive and meticulous scholarly

investigations that thoroughly examine these difficulties, providing solutions that are not only technologically feasible but also ethically robust.

1.3.2. The Importance of Making Informed Decisions

When healthcare organizations and policymakers are faced with the task of making decisions regarding the adoption, upgrading, or integration of Health Information Systems (HIS), the importance of empirical evidence cannot be overstated. The objective of this study is to establish a strong basis for making well-informed judgments, aiming to ensure that health information systems (HIS) are not only in line with technology advancements but also meet the requirements of physicians, patients, and administrators.

1.3.3. Promoting Patient-Centered Care

The shift towards patient-centered treatment is undeniable. It is imperative to comprehend the significance of Health Information Systems (HIS) in either aiding or impeding this paradigm change. The objective of this study is to provide a comprehensive understanding of the intricate relationship between Health Information Systems (HIS) and patient care. By doing so, it seeks to offer valuable insights that can inform the development and implementation of future system designs, with a focus on enhancing patient-centricity.

1.3.4. Mapping the Prospects of Health Information Systems (HIS)

In a period marked by swift technology progressions, including artificial intelligence, machine learning, and the Internet of Things (IoT), comprehending the possible trajectory of Health Information Systems (HIS) is of paramount importance. This study aims to provide a prospective outlook, imagining the future convergence of technology and healthcare, and proposing potential trajectories that Health Information Systems (HIS) may follow.

1.3.5. Addressing Knowledge Discrepancies

Despite the importance of Health Information Systems (HIS), there are still gaps in the existing scholarly literature, specifically in relation to multidisciplinary research that integrates technological, clinical, and sociopolitical aspects. The primary objective of this research endeavor is to address the existing gaps in knowledge by offering a comprehensive and all-encompassing viewpoint on Health Information Systems (HIS).

In conclusion, the justification for doing this study is supported by the difficulties and potential advantages that exist within the field of Health Information Systems (HIS). Through conducting a thorough and comprehensive investigation, this study aims to provide valuable insights that contribute to academic knowledge, have practical implications, and bring societal advantages.

1.4. Research Questions and Objectives

In light of the revolutionary changes occurring in the global healthcare sector, driven by technology breakthroughs and evolving paradigms, it is crucial to engage in a rigorous analysis and comprehension of the complex dynamics inherent in Health Information Systems (HIS). In order to achieve such comprehension, it is imperative to adopt a methodical methodology that is based on precisely formulated research inquiries and unambiguous goals. This chapter provides a comprehensive explanation of the fundamental questions that drive this study and the objectives that the research seeks to accomplish.

The fundamental aspect of any research endeavor is in its capacity to discern deficiencies in current knowledge, formulate relevant inquiries, and thereafter undertake a methodical approach to resolving those inquiries. Within the realm of Health Information Systems (HIS), this entails the examination and analysis of intricate interactions among technology, the provision of healthcare services, and the numerous individuals and groups involved. This chapter establishes the research questions and objectives, which serve as a guide for the remaining phases of the study, ensuring a clear sense of purpose and direction.

1.4.1. Inquiry Objectives

The subsequent research inquiries have been carefully formulated to encompass the fundamental investigations of this work. The objective is to analyze the various complex aspects of Health Information Systems (HIS), including technological subtleties, user dynamics, and the broader healthcare context.

Research Question 1 (RQ1): What is the historical progression of Health Information Systems over the past few decades, and what are the key factors that have influenced this progression?

The objective of this inquiry is to map out the progression of Health Information Systems (HIS), delineating significant landmarks, technological advancements, and external influences that have contributed to their present condition.

Research Question 2 (RQ2): What are the primary obstacles encountered by healthcare organizations in the successful implementation and utilization of Health Information Systems (HIS)?

The objective of this study is to investigate the obstacles, both technical and non-technical, that impede the smooth integration and effective utilization of Health Information Systems (HIS) in various healthcare environments.

Research Question 3 (RQ3): To what extent do Health Information Systems (HIS) impact clinical decision-making processes and patient outcomes?

This investigation examines the concrete effects of Health Information tools (HIS) on the provision of healthcare, investigating how these tools enhance or hinder clinical decision-making and eventually influence patient health outcomes.

Research Question 4 (RQ4): What are the perspectives and attitudes of healthcare professionals toward the adoption and integration of Health Information Systems (HIS) in their daily clinical practices?

Comprehending the human factor is of utmost importance. This inquiry aims to assess the attitudes, concerns, and endorsements of healthcare professionals, providing valuable insights into their experiences and possible avenues for enhancement.

Research Question 5 (RQ5): What is the impact of existing legal frameworks and ethical considerations on the process of designing, implementing, and utilizing Health Information Systems (HIS)?

This study aims to investigate the relationship between Health Information Systems (HIS) and the legislative and ethical frameworks that regulate them, taking into consideration the sensitive nature of patient data and the potential consequences of judgments made by AI technology.

By centering the study on these crucial inquiries, the research aims to offer a comprehensive comprehension of Health Information Systems (HIS), encompassing its historical development, present obstacles, and future prospects inside the continuously developing landscape of worldwide healthcare.

1.5. Importance of the Research

1.5.1. Introduction and Contextualization

The prominence of Health Information Systems (HIS) has grown as the world navigates the complex pathways of modern healthcare. Amidst these hallways, murmurs regarding advancements in technology, transformative shifts in the digital landscape, and the prioritization of patient-centric healthcare converge, creating a symphony of voices that emphasizes the imperative for meticulous scholarly investigation. The resonance of this work is found within the chaotic soundscape.

The integration of information technology and healthcare has given rise to a field abundant with potential and obstacles. Health Information Systems (HIS) play a crucial role in various aspects of healthcare, including improving clinical decision-making processes and increasing efficiency in administrative chores. These systems serve as vigilant observers, silently observing and documenting the significant changes occurring in healthcare paradigms. However, like to any sentinel, they do not function solely as passive observers. They engage in active participation and exert influence over the discourse around contemporary healthcare.

As we commence this section, we further explore the significant ramifications of this study. In addition to its scholarly contributions, this study serves as a valuable resource for policymakers, healthcare practitioners, and technology developers, shedding light on the complex dynamics of Health Information Systems (HIS) within the expansive field of healthcare. By providing this first contextualization, the foundation is established for exploring the complex importance of the study in the next parts.

1.5.2. The Epistemological Significance

The study's epistemological value arises from its contribution to the existing body of information pertaining to Health Information Systems (HIS). The field of epistemology, which examines the nature, origins, and limitations of knowing, provides a framework for critically evaluating the scope and significance of this research.

1.5.2.1.Enhancing Comprehension of the Evolution of Health Information Systems

The work makes a significant epistemological contribution by conducting a thorough investigation of the evolutionary trajectory of human information systems (HIS). This research contributes to the existing narrative by providing a detailed account of the progression from basic electronic record-keeping to advanced systems that incorporate artificial intelligence. It offers new viewpoints and insights into this development.

1.5.2.2.Deciphering Intricate Interactions

This study examines the complex network of interactions between health information systems (HIS) and multiple stakeholders, such as clinicians, patients, administrators, and policymakers. By doing so, it enhances our comprehension of the perceptions, utilization, and integration of these systems in various healthcare environments, thereby expanding the epistemic boundaries of the discipline.

1.5.2.3.The Integration of Theory and Practice

Another noteworthy epistemological contribution involves the integration of theoretical frameworks with practical realities. Through the utilization of real-world contexts and the identification of connections with known theories, this study acts as a guiding light for both scholars and professionals, shedding light on the mutually beneficial interplay between theory and practice.

1.5.2.4.Shedding Light on Ethical and Regulatory Dynamics

This study provides insights into the complex and ambiguous domain of ethics and legislation in the field of Health Information Systems (HIS), considering the significant concerns related to data privacy, security, and the moral implications of judgments driven by artificial intelligence (AI). This investigation not only enhances our comprehension of epistemology, but also stimulates significant discussions regarding the ethical principles that govern HIS breakthroughs.

The research possesses epistemological value as it has the capacity to broaden, enhance, and deepen the collective body of knowledge pertaining to Health Information Systems (HIS). Through the identification and examination of areas of deficiency, the questioning of existing beliefs, and the provision of novel perspectives, this research serves as a monument to the dynamic and always growing state of knowledge within this field.

1.6. Research hypotheses

Hypothesis 1 (H1): The evolution of Health Information Systems over the past few decades has been significantly influenced by technological advancements rather than policy changes. This hypothesis focuses on identifying the key drivers, such as technological innovations, that have shaped the development of these systems.

Hypothesis 2 (H2): Healthcare organizations that face the greatest obstacles in implementing Health Information Systems are those with limited technological infrastructure and resistance to change among staff. This hypothesis aims to identify and analyze both the technical and non-technical barriers impacting the successful adoption and utilization of HIS in healthcare settings.

Hypothesis 3 (H3): Health Information Systems positively impact clinical decision-making and patient outcomes predominantly in settings that have high levels of user acceptance and proper training protocols. This hypothesis examines the effectiveness of HIS in improving healthcare provision and outcomes and depends on how well healthcare professionals accept and are trained on these systems.

Each hypothesis aims to address a specific aspect of the research and can guide empirical testing to contribute to the body of knowledge in Health Information Systems.

Chapter 2: Literature Review

2. Review of Relevant Literature

The purpose of this section is to provide an overview of the topic at hand. Health Information Systems (HIS) have become essential tools in the ever-changing healthcare industry, playing a crucial role in facilitating changes and facilitating various interactions among stakeholders (Economou, 2010). These systems, which were initially in their early stages of development, have now reached a state of maturity, progressing with the larger technological and healthcare changes observed throughout the years (Mihalas et al., 2015). The body of literature pertaining to Health Information Systems (HIS) is extensive and varied, which mirrors the intricate and multifaceted characteristics of this domain.

This chapter aims to provide a thorough literature analysis, focusing on synthesizing the key scholarly discussions around Health Information Systems (HIS). This text aims to guide the reader through a carefully curated exploration, commencing with an examination of the historical roots of HIS, progressing through significant stages of development, and culminating in an analysis of current controversies and future prospects. Through the process of synthesizing existing research, the review not only offers a well-organized summary but also highlights areas where further investigation is needed, as well as gaps and contradictions in the current body of knowledge (Mantas et al., 2010).

The primary objective of this literature review is two-fold. Firstly, it aims to provide a comprehensive knowledge base for scholars, practitioners, and policymakers who are already acquainted with Health Information Systems (HIS). Secondly, it aims to serve as a starting point for individuals who are new to this field, helping them gain a better understanding of the complex interconnections that HIS create within the healthcare sector (Varlamis & Apostolakis, 2010).

2.1.Historical Development of Health Information Systems (HIS)

2.1.1. Initial Origins

The emergence of Health Information Systems (HIS) is closely intertwined with the overall development of computerization and the earliest endeavors to convert manual healthcare operations into digital formats. During the mid-20th century, when the potential of computers became apparent, some within the healthcare industry foresaw a future in which laborious paper-based procedures could be replaced by streamlined electronic systems (Papadakis et al., 2013).

2.1.2. The period prior to the advent of electrical technology:

The pre-electronic era in healthcare denotes a period characterized by the utilization of manual methods for storing, managing, and communicating medical information, devoid of electronic technologies. This era was characterized by the utilization of traditional practices and pragmatic approaches, which encompassed the use of paper and ink, tangible methods of storing information, and direct interpersonal interactions. While the knowledge of the pre-electronic age may be considered primitive in comparison to contemporary standards, it is crucial in order to comprehend the contextual backdrop against which the advancements in technology have revolutionized the field of healthcare (Katehakis et al., 2007).

The foundation of the pre-electronic age revolved around medical records that were primarily paper-based. The aforementioned documents encompassed comprehensive documentation of a patient's medical history, treatment strategies, diagnostic outcomes, and pertinent data. Authored by healthcare professionals, these handwritten documents functioned as the principal point of reference for delivering patient care.

The storage and retrieval of physical records necessitated a substantial amount of space. Hospitals and clinics allocated specific rooms or even designated entire areas for the purpose of storing medical records. The act of accessing a patient's record frequently involved the manual examination of physical files, a procedure that was both time-intensive and occasionally susceptible to mistakes.

One of the challenges in the realm of communication was the difficulty in efficiently disseminating patient information between several departments or disparate medical facilities. The necessity of physically transporting records often resulted in treatment delays, particularly in emergency scenarios. Moreover, the absence of established formats may lead to potential misinterpretations.

The vulnerability and impermanence of paper records were evident due to their susceptibility to a range of dangers, including as fire, water damage, and physical deterioration. The inherent perishability of these medical records poses a risk of permanent loss in the event of unanticipated events.

Human errors were frequently observed in record-keeping due to the manual nature of the process. These errors encompassed poor handwriting, misplacement of records, and oversight. These errors may have direct consequences for the provision of patient care.

Privacy concerns have been a matter of importance, even prior to the advent of electronic technology, particularly in relation to patient confidentiality. The possibility of unauthorized access to physical information, although less technologically advanced compared to digital breaches, was indeed a legitimate concern. Furthermore, the protection of these records necessitated the implementation of physical security protocols.

The pre-electronic age was characterized by its emphasis on tangibility, evident via the physicality of paper, the substantiality of medical texts, and the dependence on direct interpersonal interactions. Although this period presented certain difficulties, it also cultivated a notion of personalized attention and tailored assistance. The use of electronic technologies in healthcare was motivated by the imperative to enhance efficiency and accuracy, as well as the overarching goal of establishing a cohesive and interconnected healthcare infrastructure. Nonetheless, the principles and difficulties encountered during the time before the advent of electronic technology continue to hold significant importance in the chronicles of healthcare history.

2.1.3. Preliminary Explorations toward Digitalization:

The convergence of healthcare and technology in the mid to late 20th century marked a significant period of transformation. Healthcare organizations, acknowledging the constraints of manual record-keeping, initiated investigations into the possibilities offered by electronic systems in order to optimize operational efficiency, boost data precision, and elevate the quality of patient care. The early stages of digitization were marked by a combination of enthusiasm, caution, and significant challenges in the learning process (Tsopra et al., 2019).

During the late 1960s and early 1970s, several progressive healthcare organizations initiated experimental initiatives aimed at digitizing certain areas of patient record-keeping. These activities were frequently backed by substantial mainframe computers, which were the prevailing computing paradigm during that era.

Key Drivers: The transition towards electronic systems was spurred by various forces. Efficient storage and retrieval systems become necessary due to the exponential growth observed in medical information. The rising number of patients in healthcare facilities, along with the intricate nature of treatment protocols, highlights the imperative for enhanced data management technologies. Moreover, there was an increasing need for more efficient methods to address administrative challenges, including the processing of billing and insurance.

One of the notable early systems in the field was the Massachusetts General Hospital Utility Multi-Programming System (MUMPS), as noted above. Initially designed for use in hospital laboratory information systems, MUMPS has undergone significant development and transformation, resulting in its current status as a highly adaptable platform that serves as the foundation for numerous contemporary Health Information Systems.

The process of digitization encountered several hurdles and hesitations. The substantial financial expenses associated with the procurement and integration of technology posed considerable obstacles for numerous institutions. In addition, the lack of expertise with digital technologies resulted in pushback from certain healthcare practitioners, who regarded these systems with mistrust. The shift was further exacerbated by other challenges, including concerns pertaining to data security, system downtimes, and the significant learning curve experienced by users.

The issue of standardization and interoperability became apparent when an increasing number of institutions adopted computerized record-keeping practices. Interoperability was a substantial barrier due to the distinct data formats employed by various systems. During this period, there was a focus on the development of standardized codes and formats, exemplified by initiatives like the Logical Observation Identifiers Names and Codes (LOINC) and Health Level Seven (HL7). The primary objective of these efforts was to facilitate the smooth flow of data between different systems.

Gradual Progressions: In the early stages, the systems largely emphasized administrative activities and fundamental record-keeping. However, subsequent advancements provided additional features like as order entry systems, basic decision support tools, and electronic prescription systems.

Essentially, the original attempts at digitization marked the early stages of development for Health Information Systems. The initial endeavors, marked by a process of trial and error and continuous acquisition of knowledge, laid the groundwork for the advanced systems that

exist in the present period. These symbols represent the intersection of foresight, ingenuity, and unwavering commitment to delivering exceptional healthcare through technology progress.

The present study aims to explore the challenges encountered and the lessons learned throughout the research process.

2.2. Challenges & Lessons Learned

The initial phase of integrating digital technology into the healthcare sector encountered significant challenges and obstacles. Although the potential benefits of increased efficiency and enhanced patient care were apparent, the journey towards achieving this goal was fraught with a multitude of complex obstacles. Nevertheless, these problems have given rise to priceless insights that will influence the future iterations and advancements in Health Information Systems (HIS).

Resistance from healthcare professionals emerged as a notable obstacle in the implementation process. A significant portion of individuals were used to conventional approaches and held a skeptical attitude towards electronic technologies. Some practitioners typically viewed the perceived complexity of these new systems, together with concerns over time consumption and the potential for errors, as outweighing their apparent benefits.

Technical constraints: The prevailing technology framework at that period presented a distinct set of obstacles. The reliability of early computer systems was comparatively inferior to contemporary standards, resulting in frequent occurrences of system downtimes and data losses. The absence of interfaces that are easily navigable by users resulted in a burdensome system navigation experience, while the lack of robust data backup solutions presented potential hazards to the integrity of information.

One of the primary challenges associated with electronic systems was the substantial cost burden incurred in their acquisition and ongoing maintenance. The high initial investment costs of healthcare institutions, particularly smaller ones, have posed a significant barrier to their broad acceptance.

Interoperability issues arose due to the absence of standardized formats in the early digital solutions, as mentioned before. The process of sharing and transferring data between disparate systems or institutions was frequently characterized by complexity and, in some cases, rendered unattainable.

The transition to digital records has elicited apprehensions over the security and privacy of patient data. Although physical records possessed certain weaknesses, electronic data breaches have the potential to be more extensive and detrimental in nature. The initial phase of cybersecurity implementation in the healthcare industry further intensified these concerns.

The introduction of a new electronic system requires extensive training for healthcare personnel, which proves to be a time-consuming and resource-intensive process. Many institutions underestimate the extent of training needed, leading to ineffective system usage and increased resistance among staff. The key points from this experience include the importance of accurately assessing training requirements and integrating the needs and preferences of end-users into the design process. This approach, known as user-centric design, becomes a critical insight. As a result, subsequent versions of the Health Information System (HIS) emphasize more intuitive interfaces and optimized user experiences.

The involvement of stakeholders has been found to be a crucial factor in the success of implementations. It is important to engage with stakeholders early on and maintain ongoing engagement throughout the process. This approach ensures that their requirements and concerns are effectively handled. The significance of standardization becomes evident when considering the issues associated with interoperability, which emphasize the need to establish and follow industry standards for data formats and communication. The importance of ongoing training and comprehensive technical assistance was recognized as essential elements for the effective implementation of Health Information Systems (HIS). The increasing apprehensions over the security and privacy of data have led to the implementation of more rigorous cybersecurity measures and legislative frameworks aimed at safeguarding patient information. Upon reflection, the early obstacles encountered throughout the process of digitalization played a crucial role in enhancing and optimizing the Health Information System (HIS). The authors provided a practical comprehension of the complexities associated with integrating technology into healthcare, facilitating the advancement of Health Information Systems (HIS) towards the current state of sophisticated, user-friendly, and secure systems observed in the present day.

2.3. The Significance of Pioneers

The advancement of Health Information Systems (HIS) can be attributed to the foresight and pioneering efforts of those who courageously ventured into unexplored domains. The visionary thinking, inventive approaches, and steadfast dedication of these individuals established the foundation for the revolutionizing of the healthcare industry through the utilization of

technology. This section explores the significant contributions made by these pioneering individuals and the notable systems and frameworks they created.

2.3.1. Prominent Systems and Initiatives

The Massachusetts General Hospital Utility Multi-Programming System (MUMPS) was initially developed at the Massachusetts General Hospital to cater to the unique requirements of the medical setting, as previously stated. The platform's remarkable flexibility and adaptability have propelled its widespread adoption as a leading choice for medical databases on a global scale.

The VistA system, developed by the Veterans Health Administration (VHA) of the United States, is a noteworthy subject of discussion. During the 1970s, the Department of Veterans Affairs introduced VistA (Veterans Health Information Systems and Technology Architecture), which emerged as a prominent example of a comprehensive electronic health record (EHR) system. VistA demonstrated the ability to provide a unified perspective on patient care and enhance the process of clinical decision-making.

The HELP System at LDS Hospital, which was developed in Salt Lake City, represents an early example of a healthcare information system (HIS) that integrates clinical decision support functionalities. This system showcases the capacity of HIS not only to store patient data but also to analyze it and provide valuable insights. 2.3.2. Advocating for the Implementation of Standardization: Dr. Clem McDonald's groundbreaking contributions resulted in the establishment of the Logical Observation Identifiers Names and Codes (LOINC), which serves as a comprehensive and universally accepted framework for the identification of medical laboratory observations. The aforementioned project played a crucial role in effectively tackling the issue of data interoperability.

Health Level Seven (HL7) emerged in response to the urgent demand for standardized communications protocols. This collaborative effort by an international consortium of developers has been instrumental in facilitating smooth communication among diverse healthcare systems.

Pioneers in the subject of Health Information Systems (HIS) have made significant contributions through their research, scholarly publications, and academic endeavors. Institutions such as the Regenstrief Institute have made significant contributions in the fields of medical informatics, data standardization, and clinical decision support, pioneering innovative research and advancements.

Early conferences, such as MEDINFO, which were held by the International Medical Informatics Association (IMIA), served as a crucial forum for specialists to exchange research findings, engage in collaborative efforts, and influence the future direction of Health Information Systems (HIS).

The pioneers were individuals who not only possessed technological expertise, but also actively advocated for and promoted change. The proponents of electronic systems encountered several obstacles, including resistance, skepticism, and numerous problems, as they sought to encourage the integration of these systems within a predominantly paper-based environment. The user's unwavering support, encompassing both concrete advantages inside the system and the overarching goal of enhancing patient care, played a crucial role in facilitating the transformation of the prevailing paradigm.

When considering the historical development of the field of History of Information Systems (HIS), the significance of pioneers becomes evident as a testament to the potential accomplishments that can be realized via visionary thinking, collaborative efforts, and unwavering determination. The impact of their achievements extended beyond the realm of technology, as they influenced legislation, shaped best practices, and eventually, redefined the parameters of patient care for future generations.

In hindsight, the initial stages of Health Information Systems (HIS) might be perceived as a phase characterized by experimentation and knowledge acquisition. Although the current standards may perceive these systems as basic, they signified a fundamental change in the approach of healthcare organizations towards information management. The establishment of fundamental principles during this era would establish a path for the development of increasingly complex systems and create the conditions for the rise of Electronic Health Records (EHRs) and other advanced instruments in the field of Health Information Systems (HIS) in the following decades.

2.4.The Case of Greece: An In-depth Analysis of Health Information Systems Evolution

2.4.1. The Early Years: Administrative Systems (Late 1980s - 1990s)

The development of Health Information Systems (HIS) in Greece commenced during the latter part of the 1980s, following the establishment of the Greek National Health System in 1983. The era under consideration was marked by a growing fascination with the digitization of healthcare procedures. This interest was driven by the worldwide movement towards digital transformation and a recognition of the potential of information technology to improve healthcare services (Tountas et al., 2002).

During this particular era, Greece witnessed the implementation of rudimentary administrative systems within individual healthcare facilities, mirroring the initial measures adopted by numerous countries globally in the domain of Health Information Systems (HIS). The aforementioned systems were primarily digital instruments created with the purpose of overseeing administrative duties, representing a notable transition from traditional paper-based methods to electronic formats (Vavouraki & Samoutis, 2011).

The primary applications of these systems were centered on patient registration, scheduling, and billing. The implementation provided various advantages, such as increased efficiency in administrative procedures, decreased likelihood of human mistakes, enhanced accessibility and retrieval of data, and ultimately, a positive impact on the management of patient care (Symvoulakis et al., 2015).

In alignment with the prevailing global pattern, Greece also underwent a transition from rudimentary administrative systems to more specialized Health Information Systems (HIS) during the 1990s. During this era, there was a notable implementation of discipline-specific systems, such as Laboratory Information Systems (LIS) and Radiology Information Systems (RIS). These systems were specifically designed to handle specialized clinical data, representing a significant advancement in the integration of clinical information into Health Information Systems (HIS) (Tsakitzidis et al., 2015).

The implementation of Laboratory Information Systems (LIS) and Radiology Information Systems (RIS) not only enhanced the administration of targeted clinical data but also yielded wider ramifications for the provision of patient care. These systems have played a significant role in expediting diagnostic procedures, enhancing the accuracy of test results, and

ultimately improving clinical decision-making by facilitating the efficient storage, retrieval, and analysis of laboratory and radiology data (Venieris et al., 2015).

In summary, the initial phases of the evolution of Health Information Systems (HIS) in Greece occurred during the late 1980s and 1990s. During this period, the organization underwent a transition from traditional paper-based procedures to technologically advanced administrative systems, thereby integrating specialized clinical data into its operations. Despite their simplicity, these systems served as the groundwork for the subsequent developments in Health Information Systems (HIS) in Greece.

2.4.2. The Shift to Electronic Health Records (2000s)

The beginning of the 21st century brought about a notable shift in the realm of Health Information Systems (HIS) in Greece, characterized by a transition towards Electronic Health Records (EHRs). This transition exhibited a parallelism with a wider global phenomenon, in response to the increasing acknowledgment of the capacity of electronic health records (EHRs) to improve the provision of healthcare services.

The adoption of electronic health records (EHRs) in Greece was facilitated by a comprehensive digital transformation initiative at the national level. The e-Government initiative was introduced by the Greek government in 2002 with the objective of enhancing the efficiency and effectiveness of public services in different domains, such as healthcare. The development and deployment of the Integrated Information System (YSIS) constituted a fundamental element of this initiative within the healthcare sector (Papadakis et al., 2013).

The introduction of the Analysis System (YSIS) marked a notable advancement in the evolutionary trajectory of Greece's Historical Information System (HIS). The system was developed with the purpose of creating a comprehensive framework to enhance the efficiency of electronic record-keeping in public hospitals. Its main objective is to integrate various healthcare data sources into a unified and interoperable platform. The objective was to enable a comprehensive assessment of the health status of every patient, thereby fostering continuity of care, augmenting clinical decision-making, and enhancing overall efficiency of the healthcare system (Katehakis et al., 2007).

However, the journey towards achieving successful electronic health record (EHR) implementation was not devoid of obstacles. A significant obstacle encountered was the absence of standardization, as various healthcare providers implemented disparate systems, thereby impeding interoperability. Significant obstacles were encountered due to technical

difficulties associated with system design, implementation, and maintenance (Tountas et al., 2002).

One significant obstacle that arose was the opposition encountered from healthcare professionals. The transition to electronic health records (EHRs) frequently necessitated substantial alterations in operational processes, thereby giving rise to apprehensions regarding heightened work demands and potential disruptions in the provision of patient care. Insufficient training and support exacerbated these concerns, thereby impacting the acceptance and implementation of electronic health records (EHRs) (Tsopra et al., 2019).

The EHR journey in Greece was also influenced by the broader socio-economic context. The occurrence of the financial crisis in Greece in 2009 had a substantial impact on public finances, leading to limitations in funding for healthcare information technology investments. The pace of implementing Electronic Health Records (EHR) was hindered due to the constraints imposed by limited resources, which posed challenges in addressing both technical and human factors (Karanikolos et al., 2013).

Notwithstanding these challenges, the adoption of electronic health records (EHRs) in Greece during the 2000s marked a pivotal stage in the development of healthcare information systems (HIS). Although the journey proved to be more challenging and intricate than initially expected, the experiences gained during this period yielded significant insights that would influence future strategies in Greece's continuous healthcare information system (HIS) development.

2.4.3. Recent Developments and Future Prospects (2010s - Present)

The period that extend from 2010 to the present has witnessed notable progress and a resurgence of initiatives in the field of Health Information Systems (HIS) in Greece. Despite the formidable obstacles presented by the economic crisis, Greece has demonstrated commendable progress in the realm of digital health, effectively utilizing cutting-edge technologies to augment the provision of healthcare services and improve overall patient outcomes (Hatzigeorgiou & Ioannidis, 2018).

One notable advancement that occurred during this time period was the implementation of the electronic prescription system in the year 2010. The e-prescription system has emerged as a noteworthy success within the e-Government initiative, showcasing the concrete advantages of digital health. Through the process of digitization, the prescription system has effectively enhanced operational efficiency and reduced the occurrence of prescription errors,

consequently bolstering patient safety. Furthermore, the implementation of real-time tracking and verification of prescriptions has played a crucial role in mitigating the issue of prescription fraud, which poses a substantial challenge within the Greek healthcare system (Pappas et al., 2009).

The contemporary period is distinguished by the emergence of big data and artificial intelligence (AI), presenting auspicious opportunities for the advancement of Health Information Systems (HIS) in Greece. Currently, there are several pilot projects underway that are investigating the implementation of these advanced technologies in the field of healthcare. Artificial intelligence (AI) tools are currently being developed and evaluated for their capacity to augment clinical decision-making, predictive analytics, and personalized healthcare (Lampsas et al., 2003).

For example, artificial intelligence (AI) algorithms are currently undergoing training using extensive healthcare datasets in order to forecast the progression of diseases and the responses to treatments. This advancement facilitates a patient-centered approach to healthcare that is both proactive and tailored to individual needs. In the realm of healthcare, the utilization of big data analytics has emerged as a means to discern patterns and trends within healthcare data, thereby furnishing significant insights that can inform healthcare planning and policy formulation (Mantas et al., 2010).

Nevertheless, the utilization of big data and artificial intelligence (AI) in health information systems (HIS) poses a distinct array of obstacles. One of the primary concerns in this context pertains to the issues surrounding data privacy and security, which are particularly significant due to the highly sensitive nature of health-related data. One of the challenges that must be addressed in order to facilitate effective big data analytics and AI applications is the assurance of data accuracy and quality. The development of technical capacity, encompassing both physical infrastructure and skilled personnel, is of paramount importance (Venieris et al., 2015).

Overcoming these challenges necessitates collaborative endeavors from various entities, encompassing governmental bodies, healthcare practitioners, technology innovators, and the broader society. It is imperative to emphasize the equitable distribution of the advantages offered by these advanced technologies, as this would contribute to the promotion of health equity rather than exacerbating pre-existing disparities (Symvoulakis et al., 2015).

In brief, the current advancements and potential outlook for Health Information Systems (HIS) in Greece demonstrate a sustained progression that originated in the latter part of the 1980s. The role of Health Information Systems (HIS) is expected to be pivotal in shaping the future of healthcare in Greece, as the country grapples with the complexities and potential benefits of the digital health era (Karanikolos et al., 2013)

2.5. Healthcare ICT Systems During CoVid-19

Information and Communication Technologies (ICT) for healthcare unveil a plethora of new possibilities during current days. They provide a technical base for easy testing; they improve significantly the quality of service by allowing immediate access to medical data, test results and treatment history. At the same time, they facilitate correct diagnosis by employing easier analytics, data correlation and easier monitoring of patients' health parameters. They facilitate setting up appointments with appropriate doctors at a convenient time. Some medical treatments can be even conducted online. Digitisation supports the promotion of a healthy life style and can prevent diseases. Electronic healthcare solutions can be offered across borders, giving citizens the feeling of security in this respect (EU - eHealth, 2021). Digital technologies and data play a crucial role to contain the COVID-19 crisis. Information and Communication Technologies and data can offer an important tool for informing the public and helping relevant public authorities in their efforts to contain the spread of the virus or allowing healthcare organisations to exchange health data (JoinUp-EU, 2021).

However, in order for all stakeholders to fully benefit from and trust electronic services and products, they must be properly designed, implemented in cost-effective way and provide an acceptable level of security and privacy. Specific Healthcare Information Technology systems and network-connected medical devices ("Internet of Medical Things") can be considered as two main components of the healthcare environment, where certification schemes could be visualized. Accordingly, they include various sub-categories – starting from the hardware components used in the devices, to IT systems and services (cloud, portals). They all have their particularities, which need to be taken into account when discussing possible certifications. Health Information Technology is in fact the way of application of IT to the healthcare sector. It has a purpose of managing information exchange among all its stakeholders – government healthcare agencies, doctors, patients, administrators of data, insurance companies and others. Digital healthcare refers to tools and services that use information and communication technologies (ICTs) to improve prevention, diagnosis, treatment, monitoring and management of health-related issues and to monitor and manage lifestyle-habits that impact health. Digital healthcare is innovative and can improve access to care and the quality of that care, as well as

to increase the overall efficiency of the health sector (EU - eHealth, 2021). Multiple innovative solutions that make use of digital technologies can provide the means to support a reform in health and long-term care systems. eHealth, telemedicine and other digital technologies such as 4G/5G mobile communications, artificial intelligence and supercomputing offer new opportunities to transform healthcare systems. They allow the capture, management and processing of large volumes of diverse data generated from multiple sources to create new knowledge. They enable new approaches to personalised medicine, accelerating scientific progress, early diagnosis and prevention of diseases and more effective treatments. Furthermore, digital tools can assist in addressing shortages in healthcare staff in rural areas and certain specialties. They can also connect the various factors across the health and social care sectors, thus ensuring effective sharing of data and collaboration, in more effective care models. In addition, digital technologies can enable citizens to access information about health risk factors and well-being measures, and help them engage in healthy lifestyle behaviour and disease prevention. Finally, the analysis of digital health data and patient-reported data can lead to improved procedures, reduce inefficiencies, support outcome-oriented healthcare, promote the evidence-based assessment of innovative health technologies, as well as improve emergency preparedness and response to epidemics. EU policies have consistently emphasised the importance of digital solutions in healthcare (EU - digital transformation of health, 2018). Recent outbreak of CoVid-19 pandemic forced many countries to re-design their healthcare ICT systems to adapt to current needs.

2.6. Digitalising public health management

Against this wider public health background, the COVID-19 crisis is providing several examples of the use of digital technologies for health protection. First, telework and alternatives to face-to-face meetings like video conferencing are now being widely considered as a public health measure to be used at the outbreak peak and, at the same time, as a contribution to the green agenda against climate change. Telemedicine, the healthcare version of telework, is now being used in more and more from many countries as an appropriate mean to deliver care in the middle of the coronavirus outbreak (EHTEL, 2020) The COVID-19 pandemic has also highlighted the pressing need for improved data collection and exchange to better monitor and manage public health issues and health systems. Data fragmentation and the limited degree of interoperability of health information systems are inadequate to provide the right information to the right people at the right time. In 2017 OECD Council Recommendation on Health Data Governance unveiled the framework to encourage greater availability of timely

health data within countries and across borders, while ensuring that risks to privacy and security are reduced and appropriately managed. To improve co-ordination between authorities across the EU, and as part of its effort to create a European Health Data Space, the European Commission is currently developing a governance framework to promote a better use of health data, as well as a digital health infrastructure supporting such access. Once operational, it will allow better use of data for health care, research, innovation and more evidence-based health policy-making. Two decades into the 21st century, health systems need to harness more fully the potential of new information and communication systems (OECD/European Union, 2020).

A report from OECD suggests that digital data can be amplified far beyond the original user. It provides the basis for doing science at new levels and in fields outside the original intent. For example, if weather, climate and public health data is designed for interoperability (the ability of two or more systems or components to exchange information) it can be integrated to predict the outbreak of an epidemic. Open access to data can lead to research being conducted all over the world for different purposes and in different contexts. Interoperability and commitment to open access to databases is, therefore, crucial for international and interdisciplinary access and understanding of data for the development of convergence technologies (OECD, 2013). The EU recovery plan that was adopted by the European Council in July 2020 is designed to support the economic recovery from the COVID-19 pandemic and investments in the green and digital transitions of EU economies (European Council, 2020).

As already noted, alternatives to traditional face-to-face consultations are growing rapidly in many countries through the use of digital technologies, providing new opportunities to facilitate patient and doctor interactions in various ways. In 2019, primary care physicians in Sweden and the United Kingdom were more likely to offer to patients' web-based communication options such as prescription refill and test results (Michelle et al., 2019). The COVID-19 pandemic has exposed the insufficient preparation of countries to cope with major public health emergencies. The costs of having more resilient health systems pale in comparison with the huge economic consequences of failing to do so. The new coronavirus is neither the first pandemic nor the last one, and many other more or less predictable events may have a huge impact on public health. It has thus become apparent that both the global and EU health security framework need significant strengthening. Fragmentation makes us all vulnerable and it is only through multilateral cooperation that we can face up to public health threats of the magnitude of COVID-19 (OECD/European Union, 2020).

2.7. Containment strategies, citizen's mobility and geo-location data usefulness during CoVid 19 pandemic

Google Community Mobility data show how visits to categorised places changed compared to an average reference. This reference was defined as the median value from a specific period. In order to estimate the overall strictness of the containment and mitigation measures taken by countries, an average reduction in mobility was calculated over March to May 2020 (i.e. from when most European countries enforced general social distancing measures), as compared with the reference period. Analysis focused on leisure activities (restaurants, cafes, shopping centres, theme parks, museums, etc.) and public transport (OECD/European Union, 2020).

Thanks to this public-private cooperation, a systematic analysis of the relationship between human mobility and virus spread was conducted for the first time by scientists, together with a comparative cross-country analysis of the efficiency of containment measures. The data has provided clear evidence on the impact of mobility on the spread of the virus. It shows that mobility alone can explain the initial spread of the virus in Italy, France and Spain. The results also show that the containment measures taken by governments and regions, including physical distancing and mobility restrictions, were efficient in limiting the spread of the virus. Furthermore, the mobility data helped identify mobility patterns and areas, which cross regional or provincial borders. For instance, to reach the closest grocery store or the closest city offering employment possibilities, some Europeans have to cross a regional border. The findings therefore suggest that mobility restrictions should take into account such geographical mobility patterns, rather than be based on administrative areas such as regions or provinces. It also emerged that when physical distancing measures were put in place, the mobility factor became less important in defining the spread of the virus. These findings show that in the future, mobility data may support policymakers in formulating the best data-driven approaches for coming out of confinement, mapping the socio-economic effects of the lockdown measures and building future scenarios in case of new outbreaks (European Commission, Coronavirus, 2020).

Many successful health ICT applications were further developed during CoVid pandemic. SORESA and the Campania Region of Italy have cooperated to digitalise healthcare in Campania. Then the COVID emergency struck. As a result, the system was enriched with an information technology (IT) platform specialised in monitoring the emergency. The new platform brought together citizens, doctors, epidemiologists, prevention services, and laboratories. The new development enables citizens to access the results in real time and to send reports to their personal doctor. Integrated with the COVID patients' surveillance

platform, the system facilitates a structured monitoring of suspected COVID and COVID-positive patients (EHTEL, 2021).

2.8. Mobile and location-based technologies help track, trace and isolate infections

Contact tracing is an investigative process through which the recent contacts of confirmed infections are traced backwards, so that they can in turn be tested and isolated as a means to break the chain of contagion. Especially when the prevalence of infection is still relatively low and geographically limited, contact tracing can thus be an important component of an effective containment strategy. However, it is a very labour-intensive activity, which requires trained investigators to manually track down people who have been exposed to infected individuals. As the number of professional contact tracers was insufficient in most countries, and the speed at which contacts are traced is a crucial variable for the success of this strategy, several countries have investigated the possibility of automating at least part of this process using digital instruments such as smartphone apps and related technologies. Across Europe, digital contact-tracing apps have either been developed or launched in at least 23 European countries. Based on a self-report system by users who have been diagnosed as infected, these apps use data on proximity (Bluetooth) and location (cell towers and global positioning system, i.e. GPS) to identify individuals who may have been exposed to confirmed cases. Alerts are then sent to those individuals, recommending that they should be tested or even self-isolate. Some apps send broad alerts to people who were located in a certain area, and other apps send targeted alerts at specific individuals who may have been in contact with a confirmed case. Some apps are used by traditional face-to-face contact-tracers to assist them in interviewing potential contacts, while other apps are fully automated. The data generated by these apps can be communicated to, and stored in, a central server or it can be decentralised, saved only in the mobile devices of users. Some digital tools – like the Google COVID-19 Mobility Report – use collective data from many individuals to monitor changes in mobility in response to lockdowns, social distancing and quarantine policies. Other digital applications take advantage of data on specific individuals to enforce policies to contain the spread of the virus. In Poland, an app uses facial recognition and location data to monitor and enforce quarantine by imposing fines and can be used by the police. In France, cities are using artificial intelligence and CCTV to monitor the use of masks in public spaces. Lichtenstein is the first European country to use electronic bracelets to collect biometric data in real time, and the United Kingdom is using an app to collect self-reported symptoms from users. Over 50 million Europeans downloaded digital contact tracing apps in the first nine months of 2020. Close to 40% of the Icelandic

population has downloaded a similar app and between 20-30% of populations in Finland, Germany, Ireland, Norway, Switzerland and the United Kingdom have downloaded national apps. Most apps target 50-60% penetration to reduce the reproduction number of infected population. While lower adoption rates may still have some benefits, low rates will inevitably fail in their objective of facilitating traditional contact tracing efforts. There are also questions regarding the reliability and accuracy of the underlying data, and the potential for false positives and false negatives infections. Furthermore, in 2019, around 27% of individuals did not use mobile devices to access the internet in the EU. In this case, a fully automated digital contact-tracing strategy is unlikely to be successful, although it can complement traditional contact-tracing efforts (ECDC, 2020). There are also significant concerns regarding the potential for misapplication and privacy abuses. A recent assessment of 17 contact-tracing apps (including apps from Europe) found them to be insecure and easy to hack. There is also a fear that once new tools of surveillance are introduced, they are difficult to reverse, even when the crisis has passed (OECD, 2020).

2.9.Contribution of regularly collected data from electronic health records

Beyond innovative uses of mobile technology, there are rich opportunities to take advantage of the massive amount of data that are collected every day in health systems across Europe. Countries with standardised national electronic health records (EHRs) can extract high quality routine data from those systems for real-time surveillance, but only six European countries (Austria, Denmark, Estonia, Finland, Slovak Republic and the United Kingdom), have high technical and operational readiness to generate information from EHRs (Colombo, et. al., 2020). Finland and Iceland both have national EHR systems with patient portals and, as a result, were able to quickly develop the capability to track COVID-19 patients' longitudinal progress, offer integrated tools for people to report their symptoms, and triage people to appropriate services as their symptoms progressed. OECD data from 2019/2020 indicate that ten EU countries are prepared to undertake national dataset linkages in support of COVID-19 research because they routinely link at least hospital and mortality data (Austria, Czech Republic, Denmark, Finland, France, Latvia, Netherlands, Norway, Slovenia and Sweden). However, very few of these countries had data timely enough to be useful for decision-making. Only 3 out of 16 surveyed European countries had hospital and emergency care data that were updated either daily or weekly, and only two had mortality data in real time. Further, only six countries (Austria, Denmark, Estonia, Finland, Slovak Republic and the United Kingdom) made a range of health care data readily and securely available to the research community

through real-time remote access services or a research data centre. These services increase the probability of having a strong unit of researchers familiar with the data who could respond quickly to generate new information to address the crisis (OECD/European Union, 2020).

2.10. Determining Europe's digital future

The European Commission is working to provide citizens with access to safe and top-quality digital services in healthcare. The communication on the digital transformation of healthcare identifies 3 priorities:

- ⇒ Citizens' secure access to their health data, including across borders, enabling citizens to access their health data across the EU.
- ⇒ Personalised medicine through shared European data infrastructure, allowing researchers and other professionals to pool resources (data, expertise, computing processing and storage capacities) across the EU.
- ⇒ Citizen empowerment with digital tools for user feedback and person-centred care using digital tools to empower people to look after their health, stimulate prevention and enable feedback and interaction between users and healthcare providers.

A public consultation on the transformation of healthcare was held in 2017. It gathered input on the scope of policy actions to be pursued in order to improve people's healthcare. This consultation received nearly 1,500 replies of which over 90% of respondents agreed that citizens should be able to manage their own data. More than 80% of the respondents agreed that sharing health data can be beneficial and around 60% of respondents said that they do not have access to digital health services. Same results were also presented during a research in 2018 confirming that access to medical data is beneficial for citizens (K. Milioris 2021). Transformation of healthcare for a digital Europe will benefit people, healthcare systems and the economy. Digital technologies such as 5G mobile communication, artificial intelligence and supercomputing offer new opportunities to transform the way we receive and provide healthcare services. They enable innovative approaches to independent living and integrated health and social care. Health data and advanced data analytics can help accelerate scientific research, personalise medicine, and provide early diagnosis of diseases (EU - eHealth, 2021).

Building upon precedent initiatives enhancing the creation of a Europe fit for the digital age, the digital transition should be something that benefits everyone, putting people first and opening new opportunities for business. Through initiatives for health sector and health information system reform, European Member States are now actively building upon their national foundations for eHealth to deliver public health and health services in a more strategic and integrated manner. They acknowledge and understand the role of eHealth in contributing to the achievement of universal health coverage and have a clear recognition of the need for

national policies, strategies and governance to ensure the progress and long-term sustainability of investments. However, leveraging eHealth as a national strategic asset demands a more coordinated approach to planning, implementation and evaluation. Evidence of the importance of this approach is observed through a majority of European Member States developing national strategies or policies for eHealth, universal health coverage or national health information systems, and ensuring sustainable funding for their implementation (WHO, 2016).

2.11. Factors and process for digital transformation in healthcare

More important, however, is the recognition that successful investment in eHealth requires far more than just the acquisition of technology. A view of the complete spectrum of the impact and changes required to organizational processes, structures, roles, standards and legislation is needed. As well as consideration of the specifics of human resources, education, reimbursement and the culture of those who will be utilizing the eHealth services any of which can serve to derail initiatives if neglected. Perhaps the most revealing message is the need for stronger political commitment for eHealth, backed by sustainable funding, and for effective implementation of policy that is protected from frequent changes in the national political landscape. Recommendations for ICT healthcare transformation are a call to action for all Member States in the WHO European Region to take appropriate steps to strengthen their existing national eHealth foundations and to accelerate activities for future development and adoption of eHealth. Explicit political commitment by governments in the European Region to adopting eHealth is required. This commitment needs to be backed by sustainable funding for the implementation of eHealth programmes and actions for capacity-building and evaluation that are aligned with a national strategy for eHealth. An inclusive and intersectoral approach to the development of national eHealth strategies is recommended to ensure their relevance to all stakeholders and to promote shared action in achieving health objectives. Member States are further recommended to use the methodology described in the WHO and International Telecommunication Union National eHealth strategy toolkit as a basis for developing their national vision, action plan and monitoring and evaluation frameworks for eHealth. Having a national eHealth strategy that embodies the elements of achieving Health 2020 policy is a key enabler for strengthening people-centred health systems and public health capacity (WHO, 2016).

Patient care, including patient quality, patient safety and patient satisfaction, is a clear focus of healthcare organisations both in Europe and in the wider EMEA region at this time. Most of the organisations represented in this sample are stepping up to this challenge by implementing ICT solutions that focus on the clinical areas of their hospital. They are also taking the time to

address underlying infrastructure issues, such as implementing wireless systems, an intranet and identity management solutions to ensure easy and secure access to clinical (and other) data. As they move forward, healthcare organisations need to keep in mind that ICT is a tool to support the overall business objectives of the healthcare organisation. As such, it is critical that the ICT strategic plan directly supports the healthcare organisation's broader strategic initiatives. Senior ICT executives must also participate, providing them with a voice for ensuring that ICT can fully support organisational objectives. In addition, as organisations move forward with implementing clinical technologies on a wide variety of levels, they need to ensure that clinicians are involved at every stage of the process. This means that clinicians should be involved in making the decision on the technology, involved in implementing the technology, and be accountable for realising the value of the ICT investment through lower costs, better patient outcomes, smoother processes and better patient and employee satisfaction. Only then will the organisation be able to get the buy-in needed from clinicians to make the implementations successful (David Garets & Jennifer Horowitz, 2008). In addition, we must harness the lessons of this pandemic crisis and plan for a thorough assessment of health system resilience, drawing on the best practices from countries within and outside Europe and the support that the European Commission can provide. This process should involve all stakeholders and lead to better readiness for pandemics and other public health emergencies in the future (OECD/European Union, 2020).

2.12. Security and privacy

Consent of medical data access from multiple healthcare parties, could decrease privacy by leading patients to make decisions to share data where they do not understand the consequences that may be clear to persons with professional knowledge of the risks and benefits. In short, medical privacy and consent are deeply connected, but they are not equivalent (Asghar, et. al., 2017). Security threats in health care are an evolving concern. While in the financial sector the motives of an attacker are often clear, this is often not the case in health care. For instance, a phishing attacker wants to get types of private information that can be monetized in the online black markets, information like bank account passwords and credit card numbers. Accordingly, healthcare organizations store, maintain and transmit huge amounts of data to support the delivery of efficient and proper care. The downsides are the lack of technical support and minimal security. Complicating matters, the healthcare industry continues to be one of the most vulnerable to openly disclosed data breaches. Whereas implementing security measures remains a complex process, the stakes are continually raised as the ways to defeat security controls become more sophisticated. (Abouelmehdi, et. al., 2018).

Three factors need to be taken into account in predicting attacker motives and assessing security risks. First, health data often has associated administrative and financial data. For example, medical demographics may well include enough information to associate the patient name with a credit card. Moreover, personal information can be used to file fraudulent claims. Large-scale insurance fraud in the form of false billings is another common incentive.

Second, health data may become collateral damage in an attack. This threat is worsened by the regulatory review process for hospital equipment, which may slow the updating of software, hence preventing the rapid application of security patches. Detection of an intrusion in a hospital would result in the system being taken out of service until recovery is carried out.

Third, even if health data may motivate fewer attackers than in other sectors of the economy, it is often exceptionally critical to the safety of an individual and its corruption can be life-threatening. It may seem unthinkable that someone could deliberately consider corrupting health data, until it is done.

On the bright side, unlike rooms full of paper records, it is possible to trace, through electronic logs, which users look at which records so an auditor can use this information to detect abuses. There have been many examples of abuses that were caught in this way. Some involve access to the records of celebrities like athletes and actors: others involve incidents where, for instance, an employee of a provider accesses the record of a former spouse. These and other' types of abuses are often addressed by investigations carried out after a complaint (OECD, 2013).

The invasion of patient privacy is considered as a growing concern in the domain of big data analytics due to the emergence of advanced persistent threats and targeted attacks against information systems. As a result, organizations are in challenge to address these different complementary and critical issues (Abouelmehdi, et. al., 2018).

As medical data continuously transform, security and patient privacy is dominant in milestone in such technologies. Since healthcare clouds with big data become noticeable with their presence, data maintaining organizations will be more reluctant to share massive healthcare data for centralized processing. Hence, distributed processing across disparate clouds and leveraging on collective intelligence could be implemented instead. Secure patient data management is foreseeable in healthcare clouds. Where data will be collected and linked in large amounts from multiple networks. Furthermore, by ensuring secure and privacy issues real-time analytics will drive proactive healthcare and wellness (Kupwade & Seshadri, 2014).

2.13. Conclusion

The foremost lesson learnt from the COVID-19 pandemic is that there is no trade-off between lives and livelihoods. Public health and the global economy are inextricably linked. We cannot have one without the other. Healthy global economic systems depend on healthy citizens. Strengthening the preparedness and resilience of health systems will require additional resources. With the right investment – from better global public health governance, to stronger health information systems and support for a digital transformation of health systems – the return on the well-being of people and the functioning of economies and societies will be high and long-lasting (OECD/European Union, 2020). Further collaboration at EU level could strengthen mutual learning, knowledge sharing and transfer among care authorities and help those who wish to ease their path to large scale adoption of digital health innovations. Joint action can also boost the possibilities for economies of scale for technology and service suppliers and reduce the risk of fragmentation in care delivery for citizens (EU - digital transformation of health, 2018).

The history of Health Information Systems (HIS) in Greece has undergone significant development, which can be attributed to both global technological progress and the distinctive socio-political factors specific to the country. Greece's trajectory has undergone a significant transformation, progressing from basic administrative systems in the late 1980s and 1990s to the integration of electronic health records in the 2000s. Currently, Greece finds itself on the cusp of a new era characterized by the emergence of big data and artificial intelligence (Hatzigeorgiou & Ioannidis, 2018).

Greece has demonstrated remarkable resilience in the face of various challenges encountered throughout its journey, encompassing technical obstacles, opposition from healthcare professionals, and the repercussions of the financial crisis. The effective execution of the e-prescription system serves as evidence of the potential advantages associated with digital health interventions. This development represents a significant advancement in enhancing operational effectiveness, ensuring patient well-being, and optimizing resource allocation within the healthcare sector (Pappas et al., 2009).

The continuous investigation into the utilization of big data and artificial intelligence (AI) in the healthcare sector offers encouraging prospects for the future of Health Information Systems (HIS) in Greece. If properly executed, these technologies have the potential to significantly transform the delivery of healthcare by enabling the utilization of predictive analytics, personalized care, and well-informed decision-making (Tsopra et al., 2019).

Nevertheless, the path towards fully leveraging these technologies is not without obstacles. In order to fully harness the potential of these advancements, it is imperative to address several key issues, namely data privacy and security, data standardization, technical capacity, and equitable distribution of benefits (Karanikolos et al., 2013).

In summary, the development of Health Information Systems (HIS) in Greece highlights the crucial significance of information technology in contemporary healthcare. Despite encountering obstacles along the way, the advancements achieved thus far and the potential prospects ahead hold the promise of a future in which Health Information Systems (HIS) could greatly augment healthcare provision and improve outcomes in Greece. In order to shape the future, it is imperative to give careful consideration to addressing current challenges and capitalizing on emerging opportunities as this evolution progresses (Lampsas et al., 2003).

3. Research Methodology

3.1.Introduction to Quantitative Research Methodology

Quantitative research methodology is a formal, objective, and systematic process for generating numerical data that can be transformed into usable statistics. It is used to quantify behaviors, opinions, attitudes, and other defined variables and generalize results from a larger sample population (Babbie, 2015). Quantitative research uses measurable data to formulate facts and uncover patterns in research through a process of generating hypotheses (Creswell, 2014). Selecting the quantitative research method can be advantageous for a variety of reasons, depending on the research objectives, the nature of the data being collected, and the specific questions being asked. Here are some compelling arguments for choosing quantitative research:

Quantitative research is designed to test hypotheses in a rigorous and controlled manner. It allows researchers to establish clear, precise, and testable hypotheses and then use statistical methods to affirm or refute these hypotheses based on the data collected (Coolican, 2017). This approach is fundamental in many scientific disciplines where confirmation and falsification of theories are required to advance knowledge and understanding.

One of the strongest advantages of quantitative research is its potential to generalize findings from a sample to a larger population. Through the use of carefully chosen sampling methods and adequate sample sizes, quantitative studies can produce results that are not only applicable to the individuals from whom data were directly collected but also to a broader group (Trochim & Donnelly, 2008). This makes quantitative research particularly valuable in fields like public health, economics, and education, where researchers seek insights that apply to large segments of the population.

Quantitative research leverages statistical tools to analyze data, which provides a framework for understanding the data that is objective and reliable (Field, 2013). Statistical analysis can reveal patterns, relationships, and trends that might not be visible through other methods. It also allows researchers to quantify the degree of uncertainty in their conclusions, providing a scientific basis for decision-making.

Quantitative methods often yield data that are considered precise and objective. Because data collection techniques are structured and standardized, they minimize the potential for bias and subjectivity in how data are collected and interpreted (Dörnyei, 2007). This precision is crucial in fields such as the natural sciences and engineering, where precise measurements are necessary to validate theories and applications.

Quantitative studies are inherently designed to be replicable, which is a core principle of the scientific method. Because the methodology, instruments, and procedures are well-defined, other researchers can replicate the study to verify findings, explore further, or compare results across different contexts (Shadish, Cook, & Campbell, 2002). This strengthens the validity of the research and contributes to its utility over time.

Quantitative research methods can be scaled up to handle large datasets and many variables, making them suitable for large-scale studies, such as national surveys and longitudinal studies. This scalability is facilitated by advances in technology, such as automated data collection and processing, which can handle vast amounts of data efficiently (Rindfleisch, Malter, Ganesan, & Moorman, 2008).

Quantitative research can often be conducted more quickly and cost-effectively than qualitative research, especially when automated data collection methods (like online surveys) and data analysis software are used. This efficiency makes it feasible to conduct large studies or multiple studies within reasonable time frames and budgets (Neuman, 2014).

Quantitative research can be effectively used to analyze existing data, such as historical data or secondary data sources. This ability to work with pre-existing datasets allows researchers to conduct studies without the need for extensive or costly data collection efforts (Manheim, Rich, Willnat, & Brians, 2008).

These arguments suggest that quantitative research is particularly suited for studies requiring rigorous testing of hypotheses, extensive generalization across populations, precise measurements, and the ability to handle large data sets in a statistically robust way. These features make it an invaluable tool in many scientific disciplines and practical applications.

3.2.Key Characteristics of Quantitative Research

Quantifiability is a defining characteristic of quantitative research. This feature refers to the ability to measure and convert data into numerical form. This allows researchers to quantify variables and perform statistical tests to determine patterns, relationships, or differences (Trochim & Donnelly, 2008). For instance, researchers might quantify behaviors like the number of times a person purchases a product in a month, or measure attitudes through numerical scales on surveys (Dörnyei, 2007). The primary advantage of quantifiability is that it provides a clear, objective set of data that can be universally understood and analyzed (Babbie, 2015).

Generalization is another fundamental aspect of quantitative research, where findings from a studied sample are extended to apply to a larger population. This process is predicated on the assumption that the sample is representative of the population, meaning it shares the same characteristics and variability. Effective generalization requires proper sampling techniques (e.g., random sampling) to ensure the sample's representativeness (Cochran, 1977). The ability to generalize findings makes quantitative research especially powerful in predicting outcomes and behaviors in larger groups, thereby aiding in policy-making, theory-building, and various applications in real-world settings (Shadish, Cook, & Campbell, 2002).

Objectivity in quantitative research aims to ensure that the findings are unbiased and independent of the researcher's personal beliefs. This is achieved through the use of standardized procedures and tools for data collection and analysis (Creswell, 2014). By minimizing subjectivity, researchers can present results that are replicable and verifiable by others under similar conditions. For example, using the same instrument under the same conditions with different groups should yield similar results if the phenomena being measured are the same, thereby reinforcing the study's objectivity (Kirk & Miller, 1986).

3.3.Structured Research Instruments

Quantitative research commonly utilizes structured research instruments such as surveys, scales, and questionnaires. These tools are designed to collect data in a systematic and standardized manner. For example, surveys might use Likert scales to measure respondents' agreement or disagreement with a set of statements (Likert, 1932). This structure ensures that data are collected uniformly from all participants, which simplifies data aggregation and analysis (Fink, 2003). The use of these instruments also facilitates the replication of research, as the exact same instruments can be employed in different studies or repeated studies over time (Babbie, 2015).

3.4.Statistical Analysis

Statistical analysis is crucial in quantitative research as it allows researchers to interpret numerical data and draw conclusions. These techniques range from simple descriptive statistics, which describe the basic features of the data, to more complex inferential statistics, which are used to make predictions or test hypotheses. For instance, regression analysis might be used to determine how several variables contribute to an outcome (Cohen, Cohen, West, & Aiken, 2003), or t-tests might be used to compare the means of two groups (Armitage & Berry, 2002). Statistical analysis not only helps in confirming or rejecting hypotheses but also in

understanding the strength and significance of the relationships between variables (Field, 2013).

Each of these elements plays a vital role in ensuring that quantitative research is reliable, valid, and capable of contributing valuable insights into the phenomena being studied. By adhering to these principles, researchers can produce high-quality data that can influence decision-making processes and advance knowledge in various fields.

3.5.Process in Quantitative Research Methodology

3.5.1. Research Design

The research design in quantitative research is often experimental, correlational, or descriptive. It defines the type of study, research question, hypotheses, variables, and data collection methods. This stage is crucial as it helps in structuring the entire research process, thus influencing the results.

Experimental Research: Tests the impact of a specific variable on another. Variables are controlled to see the effect changes in one have on the other.

Correlational Research: Explores the relationship between variables but does not imply causation.

Descriptive Research: Aims to accurately and systematically describe a population, situation, or phenomenon.

3.5.2. Sampling

Sampling involves selecting a group of subjects (a sample) for study from a larger group (a population). Quantitative research typically requires larger sample sizes to enable the generalization of results to the population.

Random Sampling: Every individual has an equal chance of being selected.

Stratified Sampling: The population is divided into subgroups (strata) and random samples are taken from each strata.

Systematic Sampling: Selects subjects using a fixed periodic interval.

3.5.3. Data Collection Instruments

Quantitative data collection methods are structured and often include:

Surveys: Can be conducted in person, over the phone, online, or through mailed questionnaires.

Experiments: Involve manipulation and controlled testing of variables.

Observation: Systematic counting or recording of behavioral patterns in a controlled environment.

3.5.4. Data Collection

Data collection in quantitative research is more structured than in qualitative research and often involves larger numbers of respondents to obtain statistically significant results. Data collection is rigorously timed and needs to be consistent to avoid variations that could affect the data.

3.5.5. Data Analysis

After data collection, the next step is to analyze the data. This involves statistical analysis, which may include:

Descriptive Statistics: Summarize the data set, which can include mean, median, mode, and standard deviation.

Inferential Statistics: Used to interpret the data and make conclusions that extend beyond the immediate data alone.

3.5.6. Interpretation of Results

The data analysis results are interpreted in relation to the hypotheses or research questions and the broader context of the research. The interpretation should be objective, concise, and logical.

3.5.7. Reporting and Evaluation

The final step is to compile a comprehensive report that outlines the research questions, methodology, data analysis, and conclusions. The report should be written in a clear, precise, and orderly manner, making it understandable to the audience. It should also critically evaluate the limitations and strengths of the study.

3.6.Ethical Considerations in Quantitative Research

Ethical considerations in quantitative research address respect for privacy, confidentiality, informed consent, and avoidance of deceit. Proper measures should be taken to protect the confidentiality of the participants, and data should be handled responsibly to avoid misuse or breaches of privacy.

3.7.Conclusion

Quantitative research methodology is crucial in social sciences, economics, psychology, and many other disciplines. It provides a solid framework to obtain reliable and valid results that help in making informed decisions. By adhering to the structured methodology and statistical analysis, quantitative research ensures objectivity and accuracy, making it a cornerstone of scientific investigation.

4. Research findings

The integration of information systems in the healthcare sector has been widely acknowledged as a pivotal factor in enhancing the quality and efficiency of healthcare delivery. This study, encompassing a diverse group of 1216 healthcare professionals, offers a nuanced understanding of how digital literacy and the adoption of information technologies are shaping contemporary healthcare practices.

The participant demographic is skewed towards a younger, predominantly female audience, with 71.1% females and 28.9% males, indicating potential gender-specific interests or roles within the healthcare sector

The age distribution also reveals a youthful skew, with the largest proportion, 47%, falling within the 18-35 age bracket, suggesting the involvement of a demographic that is at the forefront of embracing technological changes

The educational background of participants indicates a high academic attainment, with 55.9% holding a master's degree, and a further 25.7% having a university degree, hinting at the study's appeal to a highly educated group In terms of employment distribution, the majority are from public hospitals (41.2%), followed by private hospitals (22.7%), showcasing a broad spectrum of healthcare environments. The diversity of the workforce is further highlighted by the distribution of roles, with nurses forming the largest group at 32.9%, and doctors representing 15.8% of the sample

The study focuses on the proficiency of healthcare professionals in computer and digital tools usage. A substantial majority, 55.6%, rate their computer skills as "Extremely" proficient, suggesting a high level of digital literacy among the group

This proficiency is consistent across age groups, although a decline in the highest proficiency level is observed with increasing age. A similar trend is observed across different healthcare roles, with administrative staff leading in computer proficiency, followed closely by nurses and paramedical staff

Additionally, the study examines the prevalence and integration of information systems in healthcare settings. A significant 92.1% of respondents affirm the presence of these systems in their organizations, demonstrating the sector's shift towards digitalization.

However, there is a notable gap in access to critical patient information, with 51% of respondents reporting no access to medical histories, 50.7% lacking access to medication histories, and 53.9% not having access to hospitalization records

Table 1 *Survey participant profile analysis.*

Sex					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	352	28,9	28,9	28,9
	Female	864	71,1	71,1	100,0
	Total	1216	100,0	100,0	

The data from a sample of 1216 individuals shows a significant gender disparity, with females comprising 71.1% and males 28.9%. This dominant female representation may indicate the specific context or subject of the study resonating more with women, or it could reflect a broader trend in the demographic involved. The substantial difference in gender ratios could also suggest inherent gender-related preferences or disparities in the field under study. The cumulative percentage reinforces this skew, with females making up a clear majority. Understanding the reasons behind such a pronounced gender divide is crucial, as it could reveal underlying societal or professional trends, especially if the study is within a specific sector like healthcare. This gender imbalance in participation provides valuable insights into gender dynamics within the studied population.

Table 2 *Age analysis of survey participants.*

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
	18-35	572	47,0	47,0	47,0
	35-45	440	36,2	36,2	83,2
	45-55	160	13,2	13,2	96,4
	55-65	32	2,6	2,6	99,0
	Above 65	12	1,0	1,0	100,0
	Total	1216	100,0	100,0	

The age distribution of 1216 individuals in this study reveals a youthful skew, with the largest proportion (47%) falling within the 18-35 age bracket. This dominance of younger participants might reflect the study's context or appeal to a younger demographic. The 35-45 age group follows with a substantial 36.2%, together comprising over 83% of the sample, emphasizing a significant representation of the workforce's prime ages. As age increases, participation markedly decreases, evident in the 13.2% for ages 45-55, and further dwindling to 2.6% for 55-65 and 1% for those above 65. This trend suggests either a diminishing interest or reduced availability among older age groups, possibly due to factors like retirement or lesser engagement in activities relevant to the study's focus. The data underscores the varied engagement levels across different age groups in the context under investigation.

Table 3 *Analysis of educational level of participants.*

Education				
	Frequency	Percent	Valid Percent	Cumulative Percent
Secondary education	24	2,0	2,0	2,0
College	40	3,3	3,3	5,3
University	312	25,7	25,7	30,9
Postgraduate	680	55,9	55,9	86,8
Ph.D	160	13,2	13,2	100,0
Total	1216	100,0	100,0	

The educational level distribution among 1216 individuals highlights a high academic attainment in the sample. A striking 55.9% hold a master's degree, followed by 25.7% with university indicating a predominantly well-educated group. The presence of 13.2% doctoral degree holders further emphasizes this trend, contributing to an overall high educational profile. In contrast, lower education levels such as secondary education and vocational training represent a minor fraction (2% and 3.3%, respectively). The cumulative percentages vividly illustrate the steep climb in educational attainment. This distribution suggests that the study or activity involving these participants likely appeals to or requires a higher educational background, reflecting either the nature of the topic or a broader trend in the involvement of highly educated individuals in such studies.

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Table 4 *Employment analysis.*

Employment					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Public hospital	501	41,2	41,2	41,2
	Private hospital	276	22,7	22,7	63,9
	Private clinic	100	8,2	8,2	72,1
	Other	339	27,9	27,9	100,0
	Total	1216	100,0	100,0	

The employment distribution among 1216 individuals in this study predominantly features those working in public hospitals (Δημόσιο Νοσοκομείο), comprising 41.2% of the total. This suggests a strong representation from the public healthcare sector. Private hospitals (Ιδιωτικό Νοσοκομείο) follow with 22.7%, indicating significant involvement from the private healthcare sector as well. Private clinics (Ιδιωτικό Ιατρείο) make up a smaller portion at 8.2%, pointing to a lesser but notable representation. The category labeled 'Other' (Άλλο), encompassing 27.9%, could include various healthcare-related occupations, highlighting the diversity in employment settings among the participants. The cumulative percentages illustrate a broad spectrum of healthcare environments, reflecting the diverse nature of the workforce in the healthcare sector and possibly the focus of the study on healthcare professionals from varied backgrounds and settings.

Table 5 *Analysis of professional status of participants.*

Personnel categories					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Doctor	192	15,8	15,8	15,8
	Nurse	400	32,9	32,9	48,7
	Paramedical staff	200	16,4	16,4	65,1
	Administrator	344	28,3	28,3	93,4
	Pharmacist	64	5,3	5,3	98,7
	Dentist	16	1,3	1,3	100,0
	Total	1216	100,0	100,0	

This table categorizes 1216 healthcare professionals, revealing a diverse workforce composition. Nurses (Νοσηλευτής) form the largest group at 32.9%, highlighting their crucial role in healthcare. Doctors (Ιατρός) represent 15.8%, a significant but smaller proportion, indicating a nurse-centric sample. Paramedical staff (Παραϊατρικό προσωπικό) make up 16.4%, underscoring their essential support role in medical care. Administrative staff (Διοικητικός υπάλληλος) account for a notable 28.3%, reflecting the operational importance of administration in healthcare. Pharmacists (Φαρμακοποιός) and Dentists (Οδοντίατρος) form smaller segments at 5.3% and 1.3% respectively. This distribution illustrates the varied and multi-disciplinary nature of the healthcare sector, encompassing clinical, supportive, and administrative roles, each playing a vital part in the overall healthcare ecosystem.

Table 6 *Analysis of familiarity with the use of computers*

Familiarity using a computer			
		Frequency	Percent
	Moderate	152	12,5
	Very	388	31,9
	Extremely	676	55,6
	Total	1216	100,0

This table reflects the self-assessed familiarity with computer use among 1216 individuals. A substantial majority, 55.6%, rate their computer skills as "Extremely" proficient, suggesting a high level of digital literacy in the group. Those who consider their skills "Very" good constitute 31.9%, further indicating a strong overall competence in using computers. Only a smaller portion, 12.5%, rate their abilities as "Moderate". This distribution underscores the increasing importance and integration of digital skills in modern professions or lifestyles. The high proficiency levels might reflect the sample's demographic or professional background, possibly skewed towards sectors or age groups more adept at using technology. The data suggests a trend where strong computer skills are becoming the norm, a critical insight in an increasingly digital world.

Table 7 *Familiarity of computer use in relation to age.*

I am familiar with using a computer / Age							
Familiarity		Age					Total
		18-35	35-45	45-55	55-65	Above 65	
	Moderate	52	72	16	8	4	152
	Very	164	156	60	8	0	388
	Extremely	356	212	84	16	8	676
		572	440	160	32	12	1216

The data on computer proficiency cross-referenced with age among 1216 respondents reveals significant insights. In the youngest age group (18-35), a vast majority (356 out of 572) consider themselves "Extremely" proficient, reflecting the tech-savviness of younger generations. This trend continues in the 35-45 age group, where 212 out of 440 individuals feel "Extremely" comfortable with computers. However, as age increases, a noticeable decline in the highest proficiency level is observed; only 84 out of 160 in the 45-55 age group rate themselves as "Extremely" proficient. This decline becomes more pronounced in older age groups, with only 16 out of 32 individuals aged 55-65 and 8 out of 12 individuals over 65 feeling "Extremely" proficient. This data not only highlights the generational gap in digital literacy but also underscores the growing need for inclusive technological education that caters to all age groups, ensuring that older generations are not left behind in the rapidly advancing digital world.

Table 8 *Familiarity of respondents in relation to professional status.*

I am familiar with the use of a computer * Staff category								
		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
Familiarity using a computer	Moderate	20	56	32	24	16	4	152
	Very	72	132	64	96	20	4	388
	Extremely	100	212	104	224	28	8	676
Total		192	400	200	344	64	16	1216

This table examines computer proficiency across different categories of healthcare personnel, totaling 1216 respondents. It's notable that a significant portion of each category rates their computer skills as "Extremely" proficient, with administrative staff (224 out of 344) leading this trend. This high proficiency in administrative roles may reflect the integral role of

digital tools in their work. Nurses (212 out of 400) and paramedical staff (104 out of 200) also show strong computer skills, crucial for modern healthcare environments that increasingly rely on digital records and systems. Doctors, pharmacists, and dentists, while smaller in number, still demonstrate considerable digital adeptness, indicating an overall high level of computer literacy across various healthcare roles. This widespread proficiency underscores the essential role of technology in healthcare and the necessity for healthcare professionals to be adept in digital tools to provide efficient and effective care.

Table 9 *Familiarity of respondents in relation to the employment*

I am familiar with the use of a computer * Staff employment						
		Employment				Total
		Public Hospital	Private Hospital	Private Clinic	Other	
I am familiar with the use of a computer	Moderate	48	60	8	36	152
	Very	152	104	32	100	388
	Extremely	301	112	60	203	676
Total		501	276	100	339	1216

Table 9 presents an analysis of computer proficiency based on the employment setting of 1216 healthcare professionals, categorized as public hospital, private hospital, private clinic, and other. A significant trend is the high level of computer proficiency in all sectors. Notably, in public hospitals, a majority (301 out of 501) rate their proficiency as "Extremely" high, reflecting the growing importance of digital competency in public healthcare environments. Private hospitals and clinics also show a substantial number of staff with high proficiency. The category labeled 'Other' has a notable 203 out of 339 rating themselves as "Extremely" proficient, indicating diverse employment settings within the healthcare sector where advanced computer skills are increasingly essential. This widespread high proficiency across different work environments underscores the integral role of technology in modern healthcare, necessitating proficient computer skills for efficient and effective patient care and administrative functions. The employment does not affect familiarity with the use of computers, which remains at very high levels.

Table 10 *Degree of familiarity with the use of information systems in the health sector*

I could perform the following tasks using a computer [Use of information systems in the health sector]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	20	1,6	1,6	1,6
	A little bit	80	6,6	6,6	8,2
	Moderate	172	14,1	14,1	22,4
	Very	468	38,5	38,5	60,9
	Very much	476	39,1	39,1	100,0
	Total	1216	100,0	100,0	

This table examines the proficiency of 1216 individuals in using information systems within the healthcare sector. A substantial 39.1% consider themselves "Extremely" proficient in this area, indicating a high level of comfort and skill with health-related information systems. Another 38.5% rate their proficiency as "Very" good, further emphasizing the competence within the group. Only a small fraction, 1.6%, feel they have no proficiency ("Not at all"), and 6.6% rate themselves as having "Little" proficiency. This data suggests a strong overall familiarity with healthcare information systems, a crucial skill in modern medical environments where such systems are integral for patient care, data management, and operational efficiency. The high proficiency levels reflect the increasing reliance on digital systems in healthcare and underline the importance of ongoing training and education in health informatics for healthcare professionals.

Table 11 *Degree of familiarity with the use of word processing programs.*

I could perform the following tasks using a computer [Using text editors]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	4	,3	,3	,3
	A little bit	44	3,6	3,6	3,9
	Moderate	92	7,6	7,6	11,5
	Very	376	30,9	30,9	42,4
	Very much	700	57,6	57,6	100,0
	Total	1216	100,0	100,0	

The table reflects the proficiency of 1216 individuals in using text processing programs, a fundamental skill in modern computer usage. A remarkable 57.6% of respondents are "Extremely" proficient, suggesting a deep familiarity and comfort with such software. This high proficiency is crucial in a wide range of professional and personal contexts, reflecting the ubiquitous nature of text processing in daily computer use. Additionally, 30.9% rate themselves as "Very" proficient, further indicating a strong overall competence in the group. Only a negligible 0.3% feel completely inexperienced ("Not at all"). These statistics underscore the integral role of text processing programs in contemporary digital literacy. The data highlights the importance of these skills across various sectors and the necessity for educational and training programs to focus on enhancing proficiency in text processing to keep pace with evolving technological demands.

Table 12 *Degree of familiarity with the use of spreadsheet programs.*

I could perform the following tasks using a computer [Using spreadsheet programs]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	36	3,0	3,0	3,0
	A little bit	68	5,6	5,6	8,6
	Moderate	240	19,7	19,7	28,3
	Very	392	32,2	32,2	60,5
	Very much	480	39,5	39,5	100,0
	Total	1216	100,0	100,0	

The data from 1216 respondents regarding their proficiency in using spreadsheet programs reveals an important trend in digital literacy. A significant 39.5% rate themselves as "Extremely" proficient, indicating a strong command over this essential tool in data handling and analysis. Another 32.2% consider their skills to be "Very" good, collectively showing that a majority are well-equipped to handle spreadsheet-related tasks. This proficiency is vital in numerous professional environments, where spreadsheet software plays a crucial role in organizing, analyzing, and visualizing data. However, there's a notable 3% with no proficiency and 5.6% with little proficiency, highlighting an area for potential improvement. The data underscores the importance of spreadsheet skills in the modern workplace and the need for continued education and training to enhance these abilities across various sectors

Table 13 *Degree of user familiarity with database editors*

I could perform the following tasks using a computer [Using Database Editors]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	88	7,2	7,2	7,2
	A little bit	148	12,2	12,2	19,4
	Moderate	296	24,3	24,3	43,8
	Very	408	33,6	33,6	77,3
	Very much	276	22,7	22,7	100,0
	Total	1216	100,0	100,0	

The analysis of 1216 respondents' proficiency in using database processing programs reveals varied levels of expertise. A notable 22.7% consider themselves "Extremely" proficient, indicating substantial expertise in managing and manipulating databases, a skill crucial in data-driven environments. Additionally, 33.6% rate their skills as "Very" good, collectively showing that over half the respondents are competent in this technical area. However, there is a significant portion, 7.2%, with no proficiency, and 12.2% with limited proficiency, suggesting a potential gap in knowledge that could impact efficiency in data-intensive tasks. The data underscores the importance of database processing skills in contemporary professional settings, highlighting the need for training and education in this area, particularly for those with lower proficiency levels. It reflects the growing emphasis on data management in various sectors and the necessity for a workforce skilled in navigating complex database systems.

Table 14 *Degree of user familiarity with the use of statistical analysis programs.*

I could perform the following tasks using a computer [Use of statistical analysis programs]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	148	12,2	12,2	12,2
	A little bit	192	15,8	15,8	28,0
	Moderate	396	32,6	32,6	60,5
	Very	272	22,4	22,4	82,9
	Very much	208	17,1	17,1	100,0
	Total	1216	100,0	100,0	

This table analyzes 1216 individuals' proficiency in using statistical analysis software, an essential tool in data-driven decision-making. Notably, 17.1% of respondents consider themselves "Extremely" proficient, indicating a significant expertise in handling statistical analysis tasks. A further 22.4% rate their skills as "Very" good, suggesting a strong base of users capable of conducting complex data analyses. However, there's a noticeable 12.2% with no proficiency and 15.8% with minimal skills in this area, highlighting a potential gap in a crucial competency in today's data-centric world. The cumulative percentage shows a gradual increase in proficiency levels, reflecting a diverse range of skills across the sample. This distribution underscores the growing importance of statistical software proficiency in various professional fields and the need for educational initiatives to enhance these skills, ensuring a workforce capable of navigating and interpreting increasingly data-focused landscapes.

Table 15 *Use of computers in the workplace.*

Computers are used in my workplace					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	8	0,7	0,7	0,7
	A little bit	24	2,0	2,0	2,6
	Moderate	104	8,6	8,6	11,2
	Very	292	24,0	24,0	35,2
	Very much	788	64,8	64,8	100,0
	Total	1216	100,0	100,0	

The table regarding the use of computers in the workplace among 1216 respondents shows an overwhelming majority, 64.8%, indicating "Extremely" high usage, underscoring the integral role of computers in modern work environments. A significant 24% also report "Very" high usage, collectively pointing to the widespread reliance on digital technology in professional settings. Only a marginal 0.7% report not using computers at all, and 2% use them minimally, reflecting the near-universality of computer use in contemporary workplaces. This high prevalence of computer usage highlights the digital transformation across various sectors, emphasizing the necessity for digital literacy and the importance of equipping the workforce with adequate computer skills to meet the demands of an increasingly technology-driven world.

Table 16 *Existence of information system in the workplace.*

Is there an information system in the health organization you work for?					
		Frequency	Percent	Valid Percent	Cumulative Percent
	No	96	7,9	7,9	7,9
	Yes	1120	92,1	92,1	100,0
	Total	1216	100,0	100,0	

The analysis of responses from 1216 healthcare professionals regarding the existence of information systems in their organizations reveals a significant trend. A substantial 92.1% affirm the presence of these systems, indicating a widespread adoption and integration of information technology in healthcare settings. This high percentage reflects the sector's shift towards digitalization, emphasizing the crucial role of information systems in enhancing healthcare delivery, patient management, and data handling. Conversely, only 7.9% report the absence of such systems, suggesting either a lag in technological adoption or operational differences in their specific organizations. This stark difference underscores the growing divide between digitally advanced healthcare facilities and those yet to embrace such technologies, highlighting the importance of ongoing digital transformation efforts in the healthcare sector for improved efficiency and patient care outcomes.

Table 17 *Existence of information system in the department.*

Existence of information system in the department.					
		Frequency	Percent	Valid Percent	Cumulative Percent
	No	140	11,5	11,5	11,5
	Yes	1076	88,5	88,5	100,0
	Total	1216	100,0	100,0	

The data from 1216 respondents about the existence of information systems in their specific department highlights a significant digital integration in healthcare. A notable 88.5% confirm the presence of such systems, demonstrating their widespread adoption at the departmental level. This high percentage reflects the importance and reliance on digital systems for efficient departmental operations, patient data management, and healthcare delivery. In contrast, 11.5% indicate the absence of information systems in their departments, pointing to potential disparities in technological resources and digital infrastructure across different areas within

healthcare organizations. This gap suggests a need for broader implementation and standardization of information systems to ensure uniformity in healthcare quality and operational efficiency across all departments.

Table 18 *Connection of the information system of the work department and the hospital*

If so, is the information system of the department where you work, is linked to the information system of the organization?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	260	21,4	22,3	22,3
	Yes	904	74,3	77,7	100,0
	Total	1164	95,7	100,0	
Missing	System	52	4,3		
Total		1216	100,0		

The analysis of 1216 healthcare professionals regarding the connectivity of their department's information system with the organization's main system reveals an insightful trend. Among the respondents, 74.3% confirm that their department's system is integrated with the broader organizational system, indicating a high level of interconnectedness. This integration is crucial for seamless data flow, efficient patient care, and overall operational coherence within healthcare settings. However, 21.4% report that their systems are not interconnected, suggesting potential challenges in information accessibility and coordination within these departments. This lack of integration may lead to inefficiencies or information silos, underlining the need for more cohesive technological infrastructure in healthcare. The data underscores the importance of integrated information systems in ensuring effective communication and streamlined processes in healthcare organizations.

Table 19 *Necessity of information systems in the hospital.*

The use of information systems is necessary in the field of hospitals					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Moderate	20	1,6	1,6	1,6
	Very	148	12,2	12,2	13,8
	Very much	1048	86,2	86,2	100,0
	Total	1216	100,0	100,0	

The survey of 1216 individuals on the necessity of information systems in hospitals reveals a strong consensus on their importance. A substantial majority, 86.2%, believe these systems are "Extremely" necessary, emphasizing the critical role of digital infrastructure in modern healthcare. This perspective reflects the growing reliance on technology for patient data management, healthcare delivery, and operational efficiency. Additionally, 12.2% consider these systems "Very" necessary, further underscoring the recognized importance. Only a minimal 1.6% view the necessity as "Moderate." The overwhelming agreement on the vital role of information systems in hospitals highlights the evolving nature of healthcare, where technology is not just an adjunct but a fundamental component of clinical and administrative processes. This data underscores the need for continued investment in and enhancement of digital systems within the healthcare sector.

Table 20 *Access to information about patients, medical history*

Do you have access to information about your patients? [Patient's medical history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	620	51,0	51,0	51,0
	Have	596	49,0	49,0	100,0
	Total	1216	100,0	100,0	

The survey of 1216 healthcare professionals regarding access to patients' medical histories presents a nearly even split. Half of the respondents (51%) report not having access to these vital records, indicating a significant gap in critical patient information. This lack of access could impede comprehensive patient care and informed decision-making. Conversely, the other half (49%) confirm they have access to medical histories, essential for delivering effective and personalized medical treatment. This divide highlights the discrepancies in

information availability within the healthcare system, underscoring the need for widespread and equitable access to medical histories to ensure high-quality patient care and optimized healthcare outcomes. The data suggests a pressing need for improvements in information sharing and system integration in healthcare settings.

Table 21 *Access to information about patients, diagnosis history*

Do you have access to information about your patients? [Patient diagnosis history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	692	56,9	56,9	56,9
	Have	524	43,1	43,1	100,0
	Total	1216	100,0	100,0	

The survey data from 1216 healthcare professionals regarding access to patients' diagnosis histories reveals a significant challenge in information accessibility. A notable 56.9% of respondents indicate they do not have access to these critical records. This lack of access could significantly impede effective patient care, as diagnosis histories are crucial for understanding patients' medical backgrounds and making informed treatment decisions. On the other hand, 43.1% do have access, underscoring a disparity within the healthcare system regarding the availability of essential patient information. The data highlights the need for more unified and accessible healthcare information systems, ensuring all healthcare providers have the necessary information to deliver optimal patient care. Bridging this gap is crucial for enhancing the quality and effectiveness of healthcare services.

Table 22 *Access to information about patients, medication history*

Do you have access to information about your patients? [Patient medication history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	616	50,7	50,7	50,7
	Have	600	49,3	49,3	100,0
	Total	1216	100,0	100,0	

The survey of 1216 healthcare professionals regarding access to patients' medication history reveals a critical divide. Slightly over half (50.7%) report no access to these essential records, which is concerning as medication histories are crucial for safe and effective patient

care. They provide insights into patients' treatment responses and potential drug interactions, vital for informed medical decisions. The other 49.3% do have access, highlighting a disparity in information availability within the healthcare system. This near-even split underscores the need for improved healthcare information systems that ensure comprehensive access to medication histories for all healthcare providers. Uniform access is crucial to enhance patient safety, prevent medication errors, and ensure optimal treatment outcomes.

Table 23 *Access to information about patients, hospitalization history*

Do you have access to information about your patients? [Patient hospitalization history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	656	53,9	53,9	53,9
	Have	560	46,1	46,1	100,0
	Total	1216	100,0	100,0	

The data from a survey of 1216 healthcare professionals regarding access to patients' hospitalization history indicates a significant information gap. A majority of 53.9% report that they do not have access to these histories, which is a concerning statistic. Hospitalization records are crucial for understanding a patient's medical journey, including past treatments, responses, and recovery processes. This lack of access could lead to gaps in continuity of care and hinder comprehensive treatment planning. Conversely, 46.1% of the respondents do have access to this information, pointing to an inconsistency in information availability within the healthcare system. This disparity suggests a pressing need for more integrated and accessible healthcare records, ensuring that all professionals involved in patient care have the necessary background information to provide effective and informed treatment.

Table 24 *Access to information about patients, current medication*

What kind of information about your patients do you have access to? [Patient's current medication]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	584	48,0	48,0	48,0
	Have	632	52,0	52,0	100,0
	Total	1216	100,0	100,0	

The survey of 1216 healthcare professionals about their access to patients' current medication regimens reveals a near-even split. Slightly more than half of the respondents (52%) have access to this vital information, which is crucial for ensuring appropriate ongoing treatment and preventing adverse drug interactions. This access is key to managing and monitoring patients' current health status and making informed decisions about their care. However, a significant 48% report not having access to current medication information, highlighting a notable gap in crucial patient data. This lack of access could potentially lead to medical oversights or errors. The data underscores the importance of comprehensive access to medication information for healthcare providers, emphasizing the need for improved information sharing systems in healthcare settings to ensure safe and effective patient care.

Table 25 *Access to information about patients, test results*

What kind of information about your patients do you have access to? [Patient test results]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	512	42,1	42,1	42,1
	Have	704	57,9	57,9	100,0
	Total	1216	100,0	100,0	

The survey data from 1216 healthcare professionals regarding access to patients' test results highlights a significant aspect of patient information management. A majority of 57.9% have access to these crucial results, essential for diagnosing, monitoring, and determining treatment plans. This access enables healthcare providers to make informed decisions and provide targeted care based on up-to-date patient health information. However, 42.1% report not having access to test results, indicating a notable gap in vital health information. This disparity can lead to challenges in continuity of care and informed decision-making. The data underscores the need for improved healthcare information systems that ensure comprehensive access to test results, facilitating better patient care and treatment outcomes.

Table 26 *Access to information about patients, insurance provider*

What kind of information about your patients do you have access to? [Patient's insurance provider]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	472	38,8	38,8	38,8
	Have	744	61,2	61,2	100,0
	Total	1216	100,0	100,0	

The survey of 1216 healthcare professionals regarding access to patients' insurance provider information reveals a clear majority having this access. Specifically, 61.2% of respondents can access information about a patient's insurance carrier, crucial for understanding coverage and facilitating billing processes. This access is vital in healthcare settings for efficient administrative procedures and ensuring that patients receive the care they are entitled to under their insurance plans. However, a significant 38.8% report not having access to this information, indicating a gap that could potentially complicate billing processes and patient care coordination. The data highlights the importance of integrating insurance information into healthcare systems to streamline administrative tasks and enhance the overall efficiency of healthcare delivery.

Table 27 *Access to information about patients, insurance provider coverages*

What kind of information about your patients do you have access to? [Insurer-provided patient covers]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	888	73,0	73,0	73,0
	Have	328	27,0	27,0	100,0
	Total	1216	100,0	100,0	

The survey among 1216 healthcare professionals about their access to information on patients' insurance coverage reveals a significant gap. A notable 73% of respondents report not having access to details about what their patients' insurance policies cover. This lack of information is a substantial issue, as understanding insurance coverage is crucial for healthcare providers to make informed decisions about treatment options and for ensuring that patients receive the care they need without financial surprises. On the other hand, only 27% have access

to this critical information, suggesting a need for improved communication and data sharing between healthcare providers and insurance entities. Enhancing access to insurance coverage information could significantly streamline healthcare delivery and patient care coordination.

Table 28 *Access to information about patients, based on international standards*

What kind of information about your patients do you have access to? [Standardized procedures per event based on international standards (DRGs)]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	1004	82,6	82,6	82,6
	Have	212	17,4	17,4	100,0
	Total	1216	100,0	100,0	

The survey data from 1216 healthcare professionals regarding access to standardized procedures based on international standards (Diagnosis-Related Groups, DRGs) reveals a considerable gap. A substantial 82.6% of respondents indicate they do not have access to these standardized incident procedures, which are crucial for ensuring consistency and quality in patient care. The lack of access to DRGs could impact the ability to benchmark and improve treatment protocols effectively. Conversely, only 17.4% have access to these procedures, pointing to a significant disparity in the adoption and utilization of international healthcare standards. This discrepancy highlights the need for wider implementation and integration of standardized healthcare practices to enhance the quality and consistency of patient care across various healthcare settings.

Table 29 *Access to information about patients, limit of patient examinations*

What kind of information about your patients do you have access to? [Degree of coverage of annual limit of patient examinations provided by the insurance company]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not have	1008	82,9	82,9	82,9
	Have	208	17,1	17,1	100,0
	Total	1216	100,0	100,0	

The survey of 1216 healthcare professionals about their access to information on the extent of patients' annual examination limits covered by insurance reveals a significant gap. A vast

majority, 82.9%, report not having access to this information. This lack of access can be a major hurdle in healthcare delivery, as understanding the scope of insurance coverage for examinations is crucial for planning appropriate diagnostic procedures without imposing undue financial burden on patients. Only 17.1% of respondents have access to this critical information. The data underscores the need for better integration and accessibility of insurance coverage details in healthcare systems, ensuring that providers can make informed decisions aligned with patients' coverage limitations.

Table 30 *Level of Access to the Health Information System of the employment*

Level of Access to the Health Information System of the employment									
			Personnel category						Total
			Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
HMIS Access Level HMIS[a]	Do not have	Count	956	1940	1172	1840	400	124	6432
		% within $Q_Total	14,9%	30,2%	18,2%	28,6%	6,2%	1,9%	
		% within Q41	497,9%	485,0%	586,0%	534,9%	625,0%	775,0%	
		% of Total	78,6%	159,5%	96,4%	151,3%	32,9%	10,2%	528,9%
	Have	Count	772	1660	628	1256	176	20	4512
		% within $Q_Total	17,1%	36,8%	13,9%	27,8%	3,9%	0,4%	
		% within Q41	402,1%	415,0%	314,0%	365,1%	275,0%	125,0%	
		% of Total	63,5%	136,5%	51,6%	103,3%	14,5%	1,6%	371,1%
Total		Count	192	400	200	344	64	16	1216
		% of Total	15,8%	32,9%	16,4%	28,3%	5,3%	1,3%	100,0%
Percentages and totals are based on respondents.									

Analyzing the table on healthcare professionals' access to Health Management Information Systems (HMIS) across various roles, we find disparities in access levels. The data covers 1216 respondents including doctors, nurses, paramedical staff, administrative staff, pharmacists, and dentists.

Notably, a significant portion reports not having access to HMIS. This lack is particularly pronounced among nurses and administrative staff. Conversely, a smaller proportion of the total, , indicates having HMIS access, with nurses and administrative staff again representing the larger shares within this group.

The data highlights a substantial gap in access to critical health information systems across different healthcare roles. While some roles demonstrate higher levels of access, the overall

lack of access for many healthcare professionals poses challenges for efficient patient care and data management. This disparity underscores the need for more inclusive and comprehensive access to HMIS for all healthcare professionals, ensuring effective use of data in patient care and healthcare administration.

Table 31 *Important information about patients, medical history*

What kind of information about your patients would be important to have access to? [Patient's medical history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	56	4,6	4,6	4,6
	A little bit	52	4,3	4,3	8,9
	Moderate	44	3,6	3,6	12,5
	Very	208	17,1	17,1	29,6
	Very much	856	70,4	70,4	100,0
	Total	1216	100,0	100,0	

Access to a patient's medical history is of utmost importance for healthcare professionals. According to the data, a majority (70.4%) consider having "very significant" access to this information. This level of access is crucial for making informed decisions about a patient's care, understanding their medical background, and ensuring continuity of treatment.

Furthermore, 17.1% of respondents view having "significant" access as important, indicating that a substantial portion of healthcare professionals recognizes the value of this data. Even those who rated it as "less significant" (4.3% with "little" access and 3.6% with "moderate" access) acknowledge its importance to some degree.

In summary, the data suggests that healthcare professionals overwhelmingly prioritize having extensive access to a patient's medical history to provide the best possible care and treatment.

Table 32 *Important information about patients and personnel categories, medical history*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Patient's medical history]	Not at all	0	4	4	44	0	4	56
	A little bit	8	24	0	16	4	0	52
	Moderate	4	0	4	32	4	0	44
	Very	20	84	28	60	16	0	208
	Very much	160	288	164	192	40	12	856
Total		192	400	200	344	64	16	1216

This table outlines the responses of various healthcare professionals regarding the importance of accessing patients' medical histories. It includes different categories of staff: Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. The table categorizes responses into five levels of perceived importance: . A significant majority, especially among Doctors and Nurses, rated access to medical history as "Πάρα πολύ" (Extremely important), highlighting its critical role in patient care. This data demonstrates the varying degrees of emphasis placed on patient medical history across different healthcare roles.

Table 33 *Important information about patients, diagnosis history*

What kind of information about your patients would be important to have access to? [Patient diagnosis history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	40	3,3	3,3	3,3
	A little bit	60	4,9	4,9	8,2
	Moderate	76	6,3	6,3	14,5
	Very	244	20,1	20,1	34,5
	Very much	796	65,5	65,5	100,0
	Total	1216	100,0	100,0	

Access to a patient's diagnostic history is deemed highly significant by healthcare professionals. The majority, 65.5%, consider it "extremely significant" to have comprehensive access to this information. This level of access allows for a better understanding of a patient's medical conditions, aiding in accurate diagnosis and treatment planning.

Additionally, 20.1% of respondents believe that having "significant" access is important, reinforcing the value of diagnostic history. Even those who rated it as "less significant" (4.9% with "little" access and 6.3% with "moderate" access) recognize its importance to some degree.

In summary, healthcare professionals prioritize having extensive access to a patient's diagnostic history, with a strong consensus that this information is vital for delivering high-quality care.

Table 34 *Important information about patients and personnel categories, diagnosis history*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Patient diagnosis history]	Not at all	0	4	4	32	0	0	40
	A little bit	8	24	0	24	4	0	60
	Moderate	8	4	4	48	8	4	76
	Very	24	92	48	64	16	0	244
	Very much	152	276	144	176	36	12	796
Total		192	400	200	344	64	16	1216

This table categorizes healthcare professionals' views on the importance of having access to patients' diagnostic history. It includes six categories of healthcare staff: Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. Responses are classified into five levels of importance. The highest response, " Very much " (Extremely), was most prevalent among Nurses and Doctors, emphasizing their reliance on diagnostic history. This data highlights the varying degrees of importance that different healthcare roles place on access to patients' diagnostic histories in their practice.

Table 35 *Important information about patients, medication history*

What kind of information about your patients would be important to have access to? [Patient medication history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	64	5,3	5,3	5,3
	A little bit	52	4,3	4,3	9,5
	Moderate	68	5,6	5,6	15,1
	Very	236	19,4	19,4	34,5
	Very much	796	65,5	65,5	100,0
	Total	1216	100,0	100,0	

The table presents data on healthcare professionals' views regarding the importance of accessing patients' medication history. The responses are categorized into five levels of importance: . The majority (65.5%) consider it extremely important, emphasizing the critical role of understanding a patient's medication history in providing effective healthcare. This high valuation reflects the integral nature of medication history in diagnosing, preventing medication errors, and ensuring the efficacy of treatment plans. The data underscores the healthcare sector's emphasis on comprehensive patient history for optimal care delivery.

Table 36 *Important information about patients and personnel categories, medication history*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Patient medication history]	Not at all	0	4	4	56	0	0	64
	A little bit	8	20	0	24	0	0	52
	Moderate	4	8	12	40	0	4	68
	Very	20	88	56	60	12	0	236
	Very much	160	280	128	164	52	12	796
Total		192	400	200	344	64	16	1216

This table illustrates healthcare professionals' perceptions of the importance of accessing patients' medication history, segmented by professional role: Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. Responses are divided into five levels of importance. The majority, especially among Doctors and Nurses, rated access to medication

history as " Very much " (Extremely important), highlighting its critical role in patient care. The table underscores the high value placed on medication history in healthcare, vital for accurate diagnosis, treatment planning, and minimizing medication errors.

Table 37 *Important information about patients, hospitalization history*

What kind of information about your patients would be important to have access to? [Patient hospitalization history]					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	52	4,3	4,3	4,3
	A little bit	64	5,3	5,3	9,5
	Moderate	92	7,6	7,6	17,1
	Very	260	21,4	21,4	38,5
	Very much	748	61,5	61,5	100,0
	Total	1216	100,0	100,0	

The table provides insights into healthcare professionals' views on the importance of having access to patients' hospitalization history. It categorizes responses into five levels: A significant 61.5% of the respondents consider it extremely important, indicating that a patient's hospitalization history is a critical component in their healthcare management. This high valuation suggests that understanding previous hospitalizations is key to informed decision-making in patient care, offering insights into past health issues, treatment responses, and potential future healthcare needs. This perspective underscores the integral role of comprehensive patient history in effective healthcare delivery.

Table 38 *Important information about patients and personnel categories, hospitalization history*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Patient hospitalization history]	Not at all	0	4	4	36	8	0	52
	A little bit	8	20	8	24	4	0	64
	Moderate	4	16	20	32	16	4	92
	Very	16	100	68	64	12	0	260
	Very much	164	260	100	188	24	12	748
Total		192	400	200	344	64	16	1216

The table details healthcare professionals' views on the importance of accessing patients' hospitalization history, segmented by their roles: Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. Responses are classified into five levels of perceived importance: The majority, especially among Doctors and Nurses, rated it as " Very much " (Extremely important), indicating a strong emphasis on the value of hospitalization history in patient care. This data highlights the critical importance placed on understanding a patient's hospitalization background for effective healthcare management and decision-making.

Table 39 *Important information about patients, current medication*

What kind of information about your patients would be important to have access to? [Patient's current medication]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	48	3,9	3,9	3,9
	A little bit	60	4,9	4,9	8,9
	Moderate	64	5,3	5,3	14,1
	Very	216	17,8	17,8	31,9
	Very much	828	68,1	68,1	100,0
	Total	1216	100,0	100,0	

The table provides a statistical analysis of healthcare professionals' opinions on the significance of having access to patients' current medication information. It categorizes responses into five levels of importance: A striking 68.1% of respondents rate this access as " Very much " (Extremely important), underscoring the critical nature of current medication

information in patient care. This overwhelming majority reflects the healthcare sector's emphasis on up-to-date medication data, crucial for effective treatment planning, monitoring drug interactions, and ensuring patient safety. This data demonstrates the high priority placed on accurate and current medication information in healthcare.

Table 40 *Important information about patients and personnel categories, current medication*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Patient's current medication]	Not at all	0	4	0	44	0	0	48
	A little bit	8	20	4	28	0	0	60
	Moderate	4	4	12	40	0	4	64
	Very	12	88	52	52	12	0	216
	Very much	168	284	132	180	52	12	828
Total		192	400	200	344	64	16	1216

This table shows a statistical analysis of different healthcare professionals' perspectives on the importance of accessing current medication information for their patients. The roles include Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. The responses are categorized into five levels of importance: Notably, a vast majority, particularly among Doctors and Nurses, rated this as " Very much " (Extremely important). This overwhelming response highlights the critical value placed on current medication data for effective patient care, emphasizing its role in ensuring safe and effective treatment, understanding patient needs, and preventing adverse drug interactions.

Table 41 *Important information about patients, test results*

What kind of information about your patients would be important to have access to? [Patient test results]					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	48	3,9	3,9	3,9
	A little bit	56	4,6	4,6	8,6
	Moderate	72	5,9	5,9	14,5
	Very	200	16,4	16,4	30,9
	Very much	840	69,1	69,1	100,0
	Total	1216	100,0	100,0	

This table provides a statistical analysis of healthcare professionals' opinions on the importance of accessing patients' test results. It divides responses into five levels: .A significant majority, 69.1%, consider it extremely important to have access to test results, underscoring their vital role in patient care. This high value reflects the critical nature of test results in diagnosing, monitoring, and determining treatment plans. The data indicates that most healthcare professionals rely heavily on test results for making informed decisions and providing effective care.

Table 42 *Important information about patients and personnel categories, test results*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Patient test results]	Not at all	0	8	0	40	0	0	48
	A little bit	4	16	4	32	0	0	56
	Moderate	4	16	8	24	16	4	72
	Very	20	68	44	60	8	0	200
	Very much	164	292	144	188	40	12	840
Total		192	400	200	344	64	16	1216

This table presents a statistical analysis of healthcare professionals' views on the importance of accessing patients' test results, segmented by their roles: Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. The responses are categorized into five levels of perceived importance: . A significant portion, especially among Doctors and Nurses, consider access to test results as " Very much " (Extremely important),

highlighting the critical role of test results in patient care. This overwhelming response underscores the essential nature of test results in diagnosing, monitoring treatment efficacy, and guiding clinical decisions in healthcare settings.

Table 43 *Important information about patients, test results*

What kind of information about your patients would be important to have access to? [Patient's insurance carrier]					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	60	4,9	4,9	4,9
	A little bit	120	9,9	9,9	14,8
	Moderate	180	14,8	14,8	29,6
	Very	276	22,7	22,7	52,3
	Very much	580	47,7	47,7	100,0
	Total	1216	100,0	100,0	

The table offers a statistical analysis of healthcare professionals' opinions on the significance of accessing patients' insurance information. The responses are divided into five levels of importance: Nearly half of the respondents, 47.7%, consider it extremely important to know a patient's insurance carrier. This high rating reflects the practical aspect of healthcare, where understanding insurance details is crucial for treatment approvals, cost management, and administrative procedures. The data highlights the significant role of insurance information in the broader context of patient care and healthcare delivery systems.

Table 44 *Important information about patients and personnel categories, insurance provided*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Patient's insurance provided]	Not at all	8	28	8	16	0	0	60
	A little bit	28	40	32	20	0	0	120
	Moderate	28	64	36	36	12	4	180
	Very	16	96	56	96	12	0	276
	Very much	112	172	68	176	40	12	580
Total		192	400	200	344	64	16	1216

This table provides a statistical analysis of different healthcare professionals' perspectives on the importance of having access to patients' insurance carrier information. The roles include Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. Responses are categorized into five levels of importance. Notably, a large number of respondents, especially in the Administrative and Nursing categories, rate it as "Πάρα πολύ" (Extremely important), indicating the significant role of insurance information in healthcare. This emphasis highlights the importance of understanding insurance details for treatment planning, financial management, and navigating the administrative aspects of patient care.

Table 45 *Important information about patients, insurer-provided covers*

What kind of information about your patients would be important to have access to? [Insurer-provided patient covers]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	60	4,9	4,9	4,9
	A little bit	96	7,9	7,9	12,8
	Moderate	240	19,7	19,7	32,6
	Very	304	25,0	25,0	57,6
	Very much	516	42,4	42,4	100,0
	Total	1216	100,0	100,0	

This table analyzes healthcare professionals' views on the importance of accessing information about patients' insurance coverage. Responses are classified into five levels: A notable 42.4% of respondents believe it is extremely important to know the coverage provided by a patient's insurance. This majority reflects the critical role insurance coverage plays in healthcare decision-making, influencing treatments that can be provided and financial planning for both patients and healthcare providers. The data underscores the integral role of insurance coverage details in the effective management and delivery of healthcare services.

Table 46 *Important information about patients and personnel categories, insurer-provided covers*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Insurer-provided patient covers]	Not at all	8	28	12	12	0	0	60
	A little bit	16	40	24	16	0	0	96
	Moderate	24	80	52	60	20	4	240
	Very	32	112	52	84	16	8	304
	Very much	112	140	60	172	28	4	516
Total		192	400	200	344	64	16	1216

The table provides a statistical analysis of healthcare professionals' perspectives on the importance of knowing the insurance coverage details for their patients, categorized by professional roles: Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. The responses are divided into five levels of importance: . The data shows a considerable emphasis, particularly among Administrative Staff and Nurses, on understanding insurance coverages, with 42.4% rating it as " Very much " (Extremely important). This highlights the significance of insurance information in healthcare, affecting treatment options, financial planning, and overall patient care management.

Table 47 *Important information about patients, standardized procedures*

What kind of information about your patients would be important to have access to? [Standardized procedures per event based on international standards (DRGs)]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	60	4,9	4,9	4,9
	A little bit	104	8,6	8,6	13,5
	Moderate	224	18,4	18,4	31,9
	Very	316	26,0	26,0	57,9
	Very much	512	42,1	42,1	100,0
	Total	1216	100,0	100,0	

The data presents healthcare professionals' perspectives on the importance of access to standardized incident procedures based on international DRGs. A majority (68.1%) perceive this access as highly significant ("Very" or "Extremely"), underscoring the value placed on

standardization and quality in healthcare. The mean response leans towards the upper scale (approximately 3.92), indicative of a general consensus on the importance of these procedures. However, the standard deviation of around 1.18 points to a moderate diversity in opinions, possibly reflecting variations in exposure, experience, or specific needs related to standardized practices. This diversity underscores the complexity and varied requirements within healthcare settings, highlighting the necessity for adaptable and comprehensive standards in patient care processes.

Table 48 *Important information about patients and personnel categories, standardized procedures*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Standardized procedures per event based on international standards (DRGs)]	Not at all	4	12	12	32	0	0	60
	A little bit	12	28	16	28	12	8	104
	Moderate	40	68	28	68	16	4	224
	Very	44	132	64	60	16	0	316
	Very much	92	160	80	156	20	4	512
Total		192	400	200	344	64	16	1216

This table represents healthcare professionals' views on the importance of having access to standardized procedures based on international DRGs (Diagnosis-Related Groups), broken down by professional category. The categories include Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. A total of 1216 responses were collected.

The majority, particularly Doctors (92) and Nurses (160), regard access to standardized procedures as "Extremely" important, highlighting a significant acknowledgment of the need for standardized healthcare practices. The least concern is noted in the "Not at all" category, especially among Pharmacists and Dentists, indicating a possible variance in the perceived relevance of DRGs across different roles.

However, across all categories, the responses tend to lean towards the higher importance ("Very" and "Extremely"), suggesting a broad recognition of the value of DRGs in enhancing patient care quality and consistency. This trend underscores the healthcare sector's move towards more standardized, quality-focused care delivery models, aligning with international

norms and best practices. The data also reflects the diverse roles within healthcare and how each perceives the relevance of standardized procedures in their specific areas of practice.

Table 49 *Important information about patients, degree of coverage of annual limit*

What kind of information about your patients would be important to have access to? [Degree of coverage of annual limit of patient examinations provided by the insurance company]					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	80	6,6	6,6	6,6
	A little bit	152	12,5	12,5	19,1
	Moderate	204	16,8	16,8	35,9
	Very	316	26,0	26,0	61,8
	Very much	464	38,2	38,2	100,0
	Total	1216	100,0	100,0	

The table provides a statistical analysis on the importance healthcare professionals place on accessing information about the extent of patients' annual test coverage provided by their insurance. . The responses are segmented into five levels. A notable 38.2% of respondents rate this information as extremely important, highlighting the significant role that knowledge of insurance coverage for tests plays in healthcare management. This emphasis reflects the importance of understanding insurance limits in planning and executing patient care, particularly in managing annual tests and related healthcare interventions.

Table 50 *Important information about patients and personnel categories, degree of coverage of annual limit*

		Personnel category						Total
		Doctor	Nurse	Paramedical Staff	Administrative Officer	Pharmacist	Dentist	
What kind of information about your patients would be important to have access to? [Degree of coverage of annual limit of patient examinations provided by the insurance company]	Not at all	8	28	12	20	8	4	80
	A little bit	20	64	32	28	8	0	152
	Moderate	36	84	36	36	12	0	204
	Very	36	108	52	96	16	8	316
	Very much	92	116	68	164	20	4	464
Total		192	400	200	344	64	16	1216

This table presents a statistical analysis of healthcare professionals' views on the importance of accessing information regarding the extent of annual test coverage for patients provided by their insurance, categorized by professional role. It includes Doctors, Nurses, Paramedical Staff, Administrative Staff, Pharmacists, and Dentists. The responses are categorized into five levels of importance: . The data shows a significant emphasis, particularly among Administrative Staff and Nurses, on the importance of understanding insurance coverage limits, with 38.2% rating it as " Very much " (Extremely important). This underscores the importance of insurance details in planning patient care and managing healthcare resources.

Table 51 *Purpose patients to access their information, exam results*

You believe that patients should have access to information systems with a purpose [searching for their exam results?]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	104	8,6	8,6	8,6
	A little bit	108	8,9	8,9	17,4
	Moderate	172	14,1	14,1	31,6
	Very	340	28,0	28,0	59,5
	Very much	492	40,5	40,5	100,0
	Total	1216	100,0	100,0	

This table presents a statistical analysis of healthcare professionals' opinions on whether patients should have access to information systems to search for their test results. The responses are segmented into five levels of agreement: . A significant 40.5% of respondents believe it is extremely important for patients to have this access, highlighting a strong advocacy for patient involvement and transparency in their healthcare journey. This majority reflects the growing trend of empowering patients with direct access to their health information, facilitating better understanding, engagement, and participation in their own healthcare management.

Table 52 *Purpose patients to access their information, exam history*

You believe that patients should have access to information systems with a purpose [the update with their exam history?]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	64	5,3	5,3	5,3
	A little bit	124	10,2	10,2	15,5
	Moderate	176	14,5	14,5	29,9
	Very	360	29,6	29,6	59,5
	Very much	492	40,5	40,5	100,0
	Total	1216	100,0	100,0	

This table provides a statistical analysis of healthcare professionals' views on whether patients should have access to information systems for updating themselves on their test history. The responses are segmented into five levels. Notably, 40.5% of respondents strongly support patient access to their test history, emphasizing a trend towards patient empowerment and transparency in healthcare. This perspective underlines the importance of patient engagement and informed participation in their health management, demonstrating a significant shift towards more patient-centric healthcare practices.

Table 53 *Purpose patients to access their information, appointment*

You believe that patients should have access to information systems with a purpose [making a doctor's appointment based on their medical history?]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	40	3,3	3,3	3,3
	A little bit	76	6,3	6,3	9,5
	Moderate	140	11,5	11,5	21,1
	Very	376	30,9	30,9	52,0
	Very much	584	48,0	48,0	100,0
	Total	1216	100,0	100,0	

able to use information systems to schedule appointments with doctors based on their medical history. The responses are segmented into five levels. A substantial 48% of respondents strongly agree with this proposition, indicating a significant support for patient autonomy in managing their healthcare. This data highlights a trend towards integrating patient-centric technologies in healthcare, emphasizing the importance of empowering patients to take an active role in scheduling and managing their healthcare based on their medical history.

Table 54 *patients should have access to information, finding a doctor*

Do you think patients should have access to information systems for the purpose of [finding a doctor?]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	32	2,6	2,6	2,6
	A little bit	84	6,9	6,9	9,5
	Moderate	108	8,9	8,9	18,4
	Very	400	32,9	32,9	51,3
	Very much	592	48,7	48,7	100,0
	Total	1216	100,0	100,0	

This table reflects healthcare professionals' views on whether patients should have access to information systems for the purpose of finding a doctor. The responses are segmented into five levels. A significant majority, 48.7%, believe it is extremely important for patients to have this capability, indicating strong support for patient empowerment in the selection of their healthcare providers. This trend highlights the increasing importance placed on patient autonomy and the role of technology in facilitating access to healthcare services.

Table 55 *Advantages of implementing integrated information systems, efficiency*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Improving the efficiency of administrative functions]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	4	,3	,3	,3
	A little bit	40	3,3	3,3	3,6
	Moderate	64	5,3	5,3	8,9
	Very	308	25,3	25,3	34,2
	Very much	800	65,8	65,8	100,0
	Total	1216	100,0	100,0	

The table presents healthcare professionals' perceptions of the benefits of implementing integrated information systems in healthcare, specifically focusing on improving the efficiency of administrative functions. The responses are segmented into five levels. A substantial majority, 65.8%, strongly agree that integrated information systems greatly enhance the efficiency of administrative tasks. This overwhelming response highlights the critical role of technology in streamlining healthcare administration, suggesting that such systems can significantly improve organizational efficiency, reduce paperwork, expedite processes, and ultimately lead to better patient care and resource management.

Table 56 *Advantages of implementing integrated information systems, share patient information*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Use of shared patient information]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	8	,7	,7	,7
	A little bit	52	4,3	4,3	4,9
	Moderate	128	10,5	10,5	15,5
	Very	388	31,9	31,9	47,4
	Very much	640	52,6	52,6	100,0
	Total	1216	100,0	100,0	

The table reflects healthcare professionals' opinions on the advantages of implementing integrated information systems in healthcare, particularly concerning the use of shared patient information. The responses are segmented into five levels. A significant 52.6% of respondents believe it's extremely beneficial, indicating a strong endorsement of shared patient information. This majority suggests that integrated systems can greatly enhance patient care by facilitating seamless access to medical histories, improving communication among healthcare providers, and ensuring consistency and accuracy in patient data, which are crucial for effective diagnosis and treatment.

Table 57 *Advantages of implementing integrated information systems, availability of patient information*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Immediate availability of patient information]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	12	1,0	1,0	1,0
	A little bit	60	4,9	4,9	5,9
	Moderate	76	6,3	6,3	12,2
	Very	312	25,7	25,7	37,8
	Very much	756	62,2	62,2	100,0
	Total	1216	100,0	100,0	

The table examines healthcare professionals' views on the advantages of implementing comprehensive information systems in the health sector, focusing on the immediate availability of patient information. The responses are segmented into five levels. A significant majority, 62.2%, rate the immediate availability of patient information as extremely beneficial. This strong consensus underscores the critical role of quick access to patient data in healthcare, enhancing the efficiency of medical processes, improving patient care, and facilitating timely and informed decision-making in clinical settings.

Table 58 *Advantages of implementing integrated information systems, quality of services*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Improving the quality of services provided]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	4	,3	,3	,3
	A little bit	40	3,3	3,3	3,6
	Moderate	68	5,6	5,6	9,2
	Very	268	22,0	22,0	31,3
	Very much	836	68,8	68,8	100,0
	Total	1216	100,0	100,0	

This table showcases healthcare professionals' perspectives on the benefits of using integrated information systems in the health sector, particularly in terms of improving the quality of services provided. The responses are segmented into five levels. An overwhelming 68.8% of the respondents believe that such systems significantly enhance service quality. This strong consensus highlights the value of integrated information systems in improving healthcare delivery, suggesting that they can lead to more efficient, accurate, and patient-centered services, thereby increasing the overall standard of care provided

Table 59 *Advantages of implementing integrated information systems, efficiency*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Improving the efficiency of services provided]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	8	,7	,7	,7
	A little bit	40	3,3	3,3	3,9
	Moderate	76	6,3	6,3	10,2
	Very	252	20,7	20,7	30,9
	Very much	840	69,1	69,1	100,0
	Total	1216	100,0	100,0	

This table reflects healthcare professionals' opinions on the advantages of implementing integrated information systems in the health sector, focusing on improving the efficiency of services provided. The responses are segmented into five levels. A significant majority, 69.1%, believe that such systems greatly enhance service efficiency. This high percentage indicates a strong consensus on the positive impact of integrated information systems in healthcare, suggesting they can lead to more streamlined processes, reduced waiting times, and overall more efficient healthcare delivery.

Table 60 *Advantages of implementing integrated information systems, organizational changes*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Supporting organizational changes]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	12	1,0	1,0	1,0
	A little bit	44	3,6	3,6	4,6
	Moderate	124	10,2	10,2	14,8
	Very	356	29,3	29,3	44,1
	Very much	680	55,9	55,9	100,0
	Total	1216	100,0	100,0	

This table assesses healthcare professionals' views on the benefits of integrated information systems in the health sector, specifically in supporting organizational changes. The responses are segmented into five levels. A significant 55.9% of respondents believe these systems are extremely beneficial in supporting organizational changes. This strong majority suggests that integrated information systems are perceived as key enablers for adapting to and managing changes within healthcare organizations, facilitating more efficient operations, improved communication, and the ability to rapidly respond to evolving healthcare needs and practices.

Table 61 *Advantages of implementing integrated information systems, standards and legislation*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Support functions based on standards and legislation]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	12	1,0	1,0	1,0
	A little bit	48	3,9	3,9	4,9
	Moderate	172	14,1	14,1	19,1
	Very	340	28,0	28,0	47,0
	Very much	644	53,0	53,0	100,0
	Total	1216	100,0	100,0	

This table provides insights into healthcare professionals' opinions on the advantages of using integrated information systems in the health sector, specifically for supporting functions based on standards and legislation. The responses are segmented into five levels. A substantial 53% of respondents rate this aspect as extremely beneficial, indicating a strong belief in the importance of such systems for ensuring compliance with healthcare standards and legal requirements. This majority suggests that integrated information systems are crucial for maintaining the quality and legality of healthcare services, ensuring that operations are consistently aligned with current regulations and industry standards.

Table 62 *Advantages of implementing integrated information systems, financial management*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Transparency in financial management]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	20	1,6	1,6	1,6
	A little bit	56	4,6	4,6	6,3
	Moderate	112	9,2	9,2	15,5
	Very	288	23,7	23,7	39,1
	Very much	740	60,9	60,9	100,0
	Total	1216	100,0	100,0	

This table explores healthcare professionals' perspectives on the benefits of integrated information systems in healthcare, particularly regarding transparency in financial management. The responses are segmented into five levels. An overwhelming 60.9% of respondents believe such systems greatly contribute to financial transparency. This indicates a strong consensus on the positive impact of integrated systems in enhancing the clarity and accountability of financial operations within the healthcare sector, suggesting they are essential for effective financial oversight, budget management, and the optimization of resource allocation.

Table 63 *Advantages of implementing integrated information systems, Cost Monitoring*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Operating Cost Monitoring]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	8	,7	,7	,7
	A little bit	56	4,6	4,6	5,3
	Moderate	88	7,2	7,2	12,5
	Very	324	26,6	26,6	39,1
	Very much	740	60,9	60,9	100,0
	Total	1216	100,0	100,0	

This table presents healthcare professionals' views on the advantages of implementing integrated information systems in the health sector, with a focus on monitoring operational costs. The responses are segmented into five levels. A significant 60.9% of respondents believe that such systems are extremely beneficial for tracking operational costs. This majority indicates that integrated information systems are highly valued for their ability to provide detailed insights into cost management, enabling more efficient and cost-effective healthcare operations. This perspective underscores the role of technology in optimizing resource allocation and financial planning in healthcare.

Table 64 *Advantages of implementing integrated information systems, Procurement Management*

What do you consider to be the advantages of implementing integrated information systems in the health sector? [Joint Procurement Management]					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	12	1,0	1,0	1,0
	A little bit	64	5,3	5,3	6,3
	Moderate	148	12,2	12,2	18,4
	Very	332	27,3	27,3	45,7
	Very much	660	54,3	54,3	100,0
	Total	1216	100,0	100,0	

The table provides insights into healthcare professionals' opinions on the advantages of integrated information systems in the health sector, specifically in the context of joint procurement management. The responses are segmented into five levels. A notable 54.3% of respondents rate the benefit of shared procurement management as extremely significant. This high percentage indicates a strong belief in the efficacy of integrated systems in optimizing supply chain operations, suggesting they are instrumental in streamlining procurement processes, enhancing coordination, reducing costs, and improving the availability of medical supplies.

4.1.Descriptive results conclusion

The findings from this study paint a picture of a healthcare sector that is increasingly reliant on digital technologies and information systems. The high degree of computer proficiency across various age groups and professional categories reflects the sector's adaptation to digital advancements. However, the study also uncovers significant gaps in the integration and accessibility of these systems at the departmental level, with 11.5% indicating the absence of information systems in their departments.

The disparity in access to crucial patient data, such as medical histories, medication regimens, and insurance coverage, is a concerning revelation. This gap highlights the need for improved healthcare information systems that ensure comprehensive access and enhance patient care and treatment outcomes. It underscores the necessity for ongoing investment in digital systems within the healthcare sector, coupled with the need to bridge the digital divide among different age groups.

Moreover, the study highlights the importance of aligning healthcare practices with international standards and regulations. A significant 82.6% of respondents indicate they do not have access to standardized procedures based on international standards, suggesting a need for broader implementation and integration of these practices

In conclusion, the research underscores the pivotal role of technology in healthcare, necessitating a workforce skilled in navigating digital systems and capable of utilizing these tools to enhance patient care. The need for continued education and training in digital literacy, coupled with efforts to integrate and standardize information systems, is crucial for the advancement of the healthcare sector in the modern digital era.

5. Detailed statistical analysis on health professional's perceptions

The evolution and rapid advancement of information and communication technologies (ICTs) have significantly impacted various sectors, including healthcare. Notably, both large user groups and individuals, regardless of location, have witnessed the unprecedented expansion of computer information systems. These systems are now integral to everyday tasks ranging from utility bill management to handling intricate data for multinational organizations and governments (Avgerou & Walsham, 2017; Beynon-Davies, 2013).

In recent decades, innovative computer information systems have structurally advanced business processes at all organizational levels. Despite initial skepticism, technology has enhanced coordination and procedures, ultimately boosting business productivity and efficiency (Damnjanović, 2016; Zeng & Koutny, 2019). Modern societies rely on Information Technology principles, with the most efficient companies being those that innovatively adapt to technology, using information to gain a competitive edge (Marr, 2016).

The healthcare sector is not immune to these transformations. The introduction of healthcare information systems and medical applications in Greece, for instance, followed the broader evolution of technology but at a slower pace. Despite these advancements, there is still no unified information system to integrate and fulfill the comprehensive demands of both doctors and patients for information access (Voutsidou, 2021; Economou et al., 2017).

Historically, the healthcare sector in Greece has been a late adopter of technologies such as Health Information Systems (HIS) with big data, relying heavily on paper records and disintegrated IT systems. However, the landscape is changing as the adoption of ICTs in Greek healthcare has recently begun to show growth, moving away from independent and autonomous units to more integrated data and information exchange systems (Minou et al., 2020).

The objective of current research is to assess health professionals' views on the adoption and value of health ICTs in Greece, exploring their ability to operate health information systems and their level of acceptance. The study aims to analyze health professionals' needs concerning

access to information and their usage of health ICTs (Andreassen et al., 2015; Hajli & Featherman, 2018).

As ICTs continue to revolutionize healthcare, they bring opportunities for improved service delivery, patient empowerment, and better management of medical data. The health care sector faces the challenge of meeting the increasing demands for services and innovations while ensuring security and privacy, particularly with the implementation of regulations like the EU General Data Protection Regulation (GDPR) (European Commission, 2020).

This integration of ICT in healthcare is anticipated to foster an anthropocentric health care system, focusing on the patient's needs, offering sustained medical follow-up, and enhancing the overall healthcare experience through technology (Griebel et al., 2015; Saha et al., 2008). The continuous evolution of information systems presents numerous opportunities and significant added value, paving the way for progressive evolution towards sophisticated software platforms like Enterprise Resource Planning, Customer Relationship Management, and Decision Support Systems, which are crucial in the development of competitive financial environments (Helfat et al., 2009; Ziemba, 2019).

5.1.Objectives

The aim of the present research is to assess health professionals' views on the adoption and value of health ICTs in Greece. In addition, we also seek to identify the ability of health professionals to operate HISs as well as to determine the level of acceptance and access needs to information. Furthermore, health professionals' usage of health ICTs will be analyzed. The adoption of ICT in the health care sector in Greece has started to increase in recent years, as it previously included only independent and autonomous units with little exchange of data and information between them.

5.2.Methods

A comprehensive questionnaire was designed to evaluate the perceptions of health professionals regarding the adoption and use of health ICTs in Greece. The study engaged 1,216 health professionals working in the Greek National Health System, encompassing 192 doctors, 400 nurses, 200 health practitioners, 344 administrative staff, 64 pharmacists, and 16 dentists, all randomly selected. Data collection occurred from October 2019 to March 2020

through an online structured questionnaire, which was disseminated by the Local and Regional Health Authorities to hospitals and various professional associations including the Medical Association of Greece and the Nurses Association of Greece.

The questionnaire design was based on relevant literature (Viitanen et al., 2011; Gagnon et al., 2012; Marangunić et al., 2014; Tubaishat, 2017), included multiple-choice questions and statements rated using a five-point Likert scale. It aimed to explore several dimensions:

-ICT Usage: Respondents provided insights on the penetration and type of ICTs utilized within the National Healthcare System.

-Perceptions of ICT Advantages and Disadvantages: Participants evaluated the benefits and challenges associated with the application of ICTs in healthcare settings.

-Access to Information: Questions assessed current access to patient information, needs for such information, and views on patient access to their own health records.

The responses were analyzed using IBM SPSS V.20 software, employing various statistical tests to offer descriptive statistics that outline the demographic characteristics of the participants. This methodological approach facilitated a detailed understanding of health professionals' acceptance, utilization, and perspectives on health ICTs in Greece.

5.3.Analysis and Results

Descriptive statistics were used to describe participants' demographic characteristics. Correlation tests were carried out to detect statistically significant relationships between the variables of interest, whereas a factor analysis was used to point out the core constructs of the respondents' ability to use health ICTs. Finally, a generalized linear model was used to analyze health professionals' ability to use health ICTs. All of the above-mentioned statistical tests were selected depending on the proper theoretical conditions; thus, because of the asymmetric distribution of most of the variables, nonparametric tests were carried out using SPSS at a 95% level of confidence.

5.4.Sample characteristics

Table 65 briefly presents information about the sample demographics.

Table 65 *Sample Information.*

	Demographics	Frequency	Percentage
Gender	Male	352	28.9
	Female	864	71.1
Age	18-35	572	47.0
	35-45	440	36.2
	45-55	160	13.2
	55-65	32	2.6
	Over 65	12	1.0
Education	Secondary education	24	2.0
	Upper secondary education	40	3.3
	Undergraduate studies	312	25.7
	Postgraduate studies	680	55.9
	Ph.D.	160	13.2
Employment	Public hospital	41,2	41.2
	Private hospital	22,7	22.7
	Private clinic	8,2	8.2
	Other	27,9	27.9
Staff category	Doctor	192	15.8
	Nurse	400	32.9
	Health practitioner	200	16.4
	Administrative officer	344	28.3
	Pharmacist	64	5.3
	Dentist	16	1.3

5.5. Familiarity with information systems and degree of use

The questions to be analyzed concern the respondents' familiarity with the use of information systems as well as the degree of their usage. The first question is about the familiarity with the use of information systems.

Table 66 *Respondents' familiarity with the use of information systems.*

	Neutral	Familiar	Very familiar
Doctor	20	72	100
Nurse	56	132	212
Health practitioner	32	64	104
Administrative officer	24	96	224
Pharmacist	16	20	28
Dentist	4	4	8
Total	152	388	676

As presented in Table 66, a little less than 55.92% (percentage of respondents with a postgraduate degree), i.e., 55.59%, declared that they were very familiar with the use of information systems. This is because of their young age and high level of education. A total of 31.91% were very familiar whereas 12.5% were moderately familiar with information systems use. For the staff category, half of the respondents seemed to have a very good relationship with information systems. It is worth noting that no respondent reported having little or no familiarity with information systems—a fact that highlights the penetration of information systems into the health care field.

An important aspect to be examined is the existence of an integrated information system at the respondents' workplaces. Of the respondents, 92.11% declared that there was an information system at their workplace.

5.6. Access to information

As previously mentioned, the main aim of this research was to investigate the access as well as the requirements of medical professionals concerning information systems in healthcare. The questionnaire's consistency was evaluated using Alpha-Cronbach's. The value of the result was equal to 0.801, representing increased rate of internal consistency and valid question structure. Therefore, the questionnaire that was distributed was constructed appropriately and the recorded data were eligible for statistical analysis.

As it can be concluded for the below figure, the kind of healthcare information that is more regularly required is the patients' type of insurance provider (61.6%), followed by medical examination results (58.3%). The least accessible type of data concerns the Diagnosis Related Groups (DRGs) (17.5%). Access to DRGs should be provided through an integrated system, provided that access to this kind of data can contribute to patient classification and assist in the efficient distribution of funds.

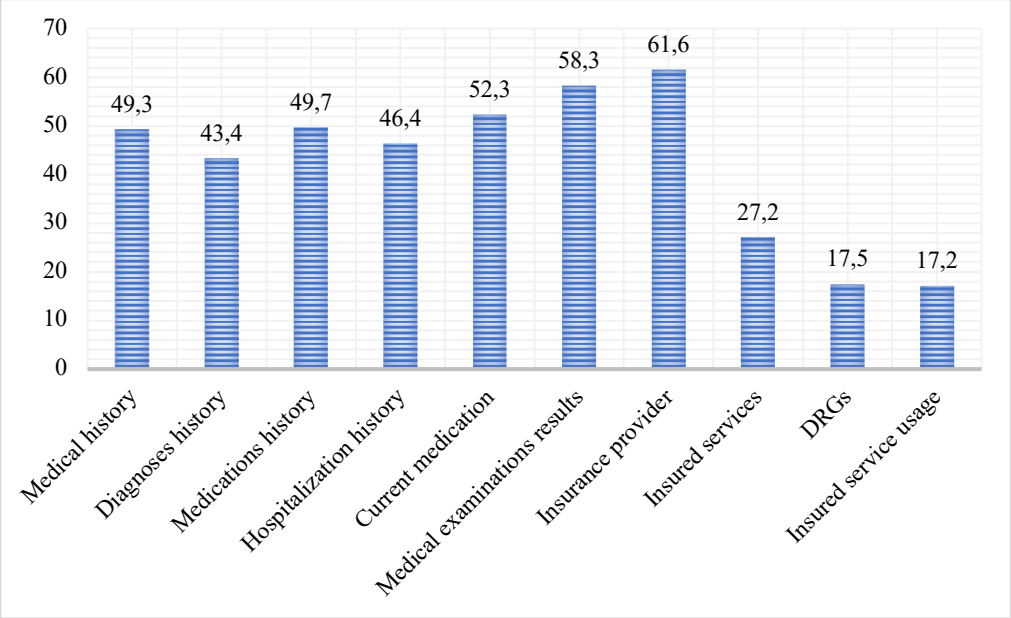

Figure 1. *Importance of information access for healthcare professionals (%).*

A very important aspect for both health services providers and every person employed in the health sector is the access to their patients' information. Table 67 shows the health staff access to their patients' information. It is notable that nursing staff had access to more information in terms of the patients' diagnosis history, medication history, current medication, medical examination results, and health insurance provider information than the doctors did. Furthermore, dentists seemed to be the less informed about their patients. Finally, very low access to information concerning patients' diagnosis-related groups was recorded, as administrative officers are the most informed ones (19.8%).

Table 67 *Access to patients' information by staff category (%).*

	Doctor	Nurse	Health practitioner	Administrative officer	Pharmacist	Dentist
Medical history	56,3	43	50	54,7	31,3	50
Diagnoses history	43,8	47	42	45,3	18,8	0
Medications history	50	55	46	41,9	68,8	25
Hospitalization history	56,3	52	34	48,8	6,3	25
Current medication	62,5	63	44	33,7	81,3	25
Medical examinations results	70,8	73	52	47,7	12,5	0
Insurance provider	47,9	72	46	66,3	62,5	25
Insured services	33,3	20	20	39,5	6,3	25
DRGs	18,8	17	18	19,8	6,3	0
Insured service usage	18,8	16	12	22,1	12,5	0

5.7. Information systems advantages

The adoption of information systems by health organizations can have many positive effects, these results are presented in Table 68. According to most health professionals who participated in the survey, improvement in efficiency is the most important positive effect of information systems (91.1% agree or strongly agree).

Table 68 *Positive effects of information systems (%).*

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Efficiency	0.33	3.29	5.26	25.33	65.79
Common data	0.70	4.30	10.50	31.90	52.60
Ease of access	0.99	4.93	6.25	25.66	62.17
Quality improvement	0.33	3.29	5.59	22.04	68.75
Changes support	0.99	3.62	10.20	29.28	55.91
Cost monitoring	0.66	4.61	7.24	26.64	60.85

The demographic characteristics of the sample appeared to partially affect respondents' views on the advantages of information systems. For the examination of possible correlations, Spearman's correlation coefficient and Pearson's chi-square have been used.

Table 69 *Correlation of respondents' demographics and their perceptions of the advantages of ICTs.*

		Sig.	r[a]	Test
Age	Efficiency	0.000*	0.120	ii
	Common data	0.000*	0.152	ii
	Ease of access	0.002*	0.089	ii
	Quality improvement	0.005*	0.081	ii
	Changes support	0.000*	0.160	ii
	Cost monitoring	0.000*	0.106	ii
Education	Efficiency	0.000*	0.195	ii
	Common data	0.000*	0.173	ii
	Ease of access	0.000*	0.114	ii
	Quality improvement	0.000*	0.112	ii
	Changes support	0.000*	0.196	ii
	Cost monitoring	0.000*	0.220	ii
Employment	Efficiency	0.089		i
	Common data	0.057		i
	Ease of access	0.218		i
	Quality improvement	0.412		i
	Changes support	0.058		i
	Cost monitoring	0.034		i
Staff category	Efficiency	0.112		i
	Common data	0.000*		i
	Ease of access	0.098		i
	Quality improvement	0.000*		i
	Changes support	0.000*		i
	Cost monitoring	0.218		i

Tests: (i): Pearson's Chi-Square, (ii) Spearman's correlation coefficient

[a] Denotes Spearman's Rho

[*] Denotes statistically significant correlation

From Table 69, we can conclude that the data presented the following table, respondents' views on the advantages of information systems, are affected by the variables concerning health professionals' age, educational level, employment, and staff category. However, employment has no effect on the examined views, which means that the views on the advantages of information systems are the same for all respondents regardless of whether someone is working in a public or private hospital or a private clinic. Finally, staff category is correlated with the advantages of common data usage, quality improvement, and support for organizational changes. By using-cross tabulation analysis, we can conclude that doctors, nurses, health practitioners, and administrative officers are the staff categories for which a higher level of agreement with the aforementioned advantages was recorded.

5.8. Health professionals' ability to use information systems

For a more in-depth analysis of health professionals' ability to use information systems, a general linear model will be constructed. To do so, we conducted a factor analysis.

The factor analysis used the Varimax rotation, which reduces the total sum of variables with increased load and converts them into a more understandable form. The main aim is to obtain important correlations among the variables. Consequently, we calculated correlation coefficients as well as partial correlation coefficients. In addition, the relative magnitude of the correlation coefficients with the partial correlation coefficients should be compared. The measurement that provides the value of this comparison is Kaiser–Meyer–Olkin. Here the Kaiser–Meyer–Olkin value is 0.872, which can be considered satisfactory. The factor analysis exported five factors:

- Information systems advantages
- Information on patients' medication history
- Ability to use information systems
- Patients' access to data
- Information on patients' insurance

According to the above results, health professionals' ability to use information systems is the third factor in the factor analysis we conducted. The variables included in this factor are presented in Table 70.

Table 70 *Factor analysis results concerning the third factor.*

Variable	Factor loading
Familiarity with PC's usage	0.756
Ability to use health information systems	0.677
Ability to use word processors	0.709
Ability to use spreadsheets	0.823
Ability to use data bases	0.810
Ability to use statistical analysis software	0.738

The next step is to construct the univariate general linear model. The dependent variable was the factor concerning health professionals' ability to use information systems, whereas the independent variables were the demographics.

Table 71 *Tests of between-subjects effects.*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.776	1	1.776	4.307	0.038
Gender	4.346	1	4.346	10.537	0.001
Age	14.315	4	3.579	8.677	0.000
Education	21.455	4	5.364	13.005	0.000
Employment	13.257	3	4.419	10.715	0.000
Staff category	14.803	5	2.961	7.178	0.000

Before constructing the regression model, it is useful to explain the way the categorical variables were taken into consideration. For example, the variable regarding the respondents' gender has two values: male and female. Because this variable is categorical, no mathematical calculations can be made. That is why the so-called dummy variables are created. Because this

categorical variable has two values, one dummy variable is created. Now, X_1 means that gender is male; otherwise, gender is female.

Table 72 *Regression parameter estimates.*

Parameter		B	Std. Error	T	Sig.
Intercept		47.853	10.287	4.652	0.000
Gender	Male (X_1)	-33.743	7.501	-4.498	0.000
	Female	0[a]	.	.	.
Age	18-35 (X_2)	15.793	5.513	-2.865	0.004
	35-45 (X_3)	21.128	5.658	-3.734	0.000
	45-55 (X_4)	-17.754	5.126	-3.463	0.001
	55-65 (X_5)	-5.314	5.633	.943	0.346
	Over 65	0[a]	.	.	.
Education	Secondary education (X_6)	-13.865	3.460	-4.008	0.000
	Upper secondary education (X_7)	-67.627	18.306	-3.694	0.000
	Undergraduate studies (X_8)	-48.988	13.180	-3.717	0.000
	Postgraduate studies (X_9)	35.179	13.470	-2.612	0.009
	Ph.D.	0[a]	.	.	.
Employment	Public hospital (X_{10})	-21.066	6.627	-3.179	0.002
	Private hospital (X_{11})	-30.066	6.781	-4.434	0.000
	Private clinic (X_{12})	-3.870	8.802	-.440	0.660
	Other	0[a]	.	.	.
Staff category	Doctor (X_{13})	28.750	6.781	-4.240	0.000
	Nurse (X_{14})	-2.840	.786	-3.613	0.000
	Health practitioner (X_{15})	-18.812	3.870	-4.861	0.000
	Administrative officer (X_{16})	-15.402	3.826	-4.026	0.000
	Pharmacist (X_{17})	3.176	.454	-6.994	0.000
	Dentist	0[a]	.	.	.

[a] This parameter is set to zero because it is redundant.

According to the data presented in Table 8, we can see that all of the demographic variables were correlated at a statistically significant level with health professionals' ability to use information systems. The model's adjusted R^2 was 0.740, which means that the demographics can explain 74% of health professionals' ability to use the variability of information systems. The general linear regression model can now be written as follows:

$$Y = 33.74X_1 + 15.79X_2 - 21.13X_3 - 17.75X_4 - 13.86X_6 - 67.63X_7 - 48.99X_8 + 35.18X_9 - 21.06X_{10} - 30.06X_{11} + 28.75X_{13} - 2.84X_{14} - 18.81X_{15} - 15.40X_{16} + 3.18X_{17} + 47.85 \quad (1)$$

According to the above equation, both older health professionals and these with a lower level of education seemed to have lower levels of ability to use information systems. Furthermore, nurses, dentists, and health practitioners also had lower levels of ability to use information systems.

5.9.Health insurance and health professionals

An additional significant aspect to focus is the connection of insurance providers and the type of health professionals. By performing an Anova test among these two variables, we will try to find if these variables are significantly different from each other.

Table 73 *One-way Anova test*

Analysis of variance (ANOVA)					
Do you believe it is vital information to know the insurance provider of your patients?					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	58,549	5	11,710	8,232	0,000
Within Groups	1812,201	1274	1,422		
Total	1870,750	1279			

Concluding from above results in table 1, we can realise that we have an important result. There is a statistically significant difference between groups as demonstrated by one-way ANOVA (F(5,1274) = 8.232, p = .000). Observing the value of F (8.232) we can notice that it reaches significance with a p-value (0.000) which is below the 0.05 alpha level. Consequently, this indicates statistically significant difference among the means of the multitude of types of health professionals.

Though, it is yet unclear among which group of means there is a significant difference. Generally, an Anova Tukey HSD test is the recommended test for conducting post hoc tests on a one-way ANOVA. This test was implemented to examine which of the respondent groups is more interested in the insurance provider information, since according to the above results, health professionals showed more interest in this kind of information. The respondent group consists of 6 categories: doctors, nurses, paramedical staff, administrative staff, pharmacists and dentists.

Table 74 *Anova Tukey HSD*

Multiple Comparisons						
Dependent Variable: Do you believe it is vital information to know the insurance provider of your patients?						
		Mean Difference			95% Confidence Interval	
(L) Medical type	(M) Medical group	(L-M)	Std. Error	Sig.	Lower Bound	Upper Bound
Doctors	Nurses	0.198	0.102	0.384	-0.09	0.49
	Paramedical staff	0.354*	0.118	0.033	0.02	0.69
	Administrative staff	-0.130	0.105	0.821	-0.43	0.17
	Pharmacists	-0.407	0.171	0.166	-0.90	0.08
	Dentists	-0.470	0.310	0.654	-1.35	0.42
Nurses	Doctors	-0.198	0.102	0.384	-0.49	0.09
	Paramedical staff	0.156	0.100	0.627	-0.13	0.44
	Administrative staff	-0.328*	0.085	0.002	-0.57	-0.08
	Pharmacists	-0.605*	0.160	0.002	-1.06	-0.15
	Dentists	-0.667	0.304	0.239	-1.53	0.20
Paramedical staff	Doctors	-0.354*	0.118	0.033	-0.69	-0.02
	Nurses	-0.156	0.100	0.627	-0.44	0.13
	Administrative staff	-0.484*	0.103	0.000	-0.78	-0.19
	Pharmacists	-0.761*	0.170	0.000	-1.25	-0.28
	Dentists	-0.824	0.309	0.083	-1.71	0.06
Administrative staff	Doctors	0.130	0.105	0.821	-0.17	0.43

	Nurses	0.328*	0.085	0.002	0.08	0.57
	Paramedical staff	0.484*	0.103	0.000	0.19	0.78
	Pharmacist	-0.277	0.162	0.522	-0.74	0.18
	Dentists	-0.340	0.305	0.875	-1.21	0.53
Pharmacists	Doctors	0.407	0.171	0.166	-0.08	0.90
	Nurses	0.605*	0.160	0.002	0.15	1.06
	Paramedical staff	0.761*	0.170	0.000	0.28	1.25
	Administrative staff	0.277	0.162	0.522	-0.18	0.74
	Dentists	-0.063	0.333	1.000	-1.01	0.89
Dentists	Doctors	0.470	0.310	0.654	-0.42	1.35
	Nurses	0.667	0.304	0.239	-0.20	1.53
	Paramedical staff	0.824	0.309	0.083	-0.06	1.71
	Administrative staff	0.340	0.305	0.875	-0.53	1.21
	Pharmacists	0.063	0.333	1.000	-0.89	1.01

From the Tukey Honest Significant Difference (HSD) test can be understood that a statistically important difference exists between doctors and paramedical staff (0.033). There is also a statistically important difference when nurses are compared with administrative staff and pharmacists. This also applies to paramedical staff when they are compared with doctors, administrative staff and pharmacists. Additionally, a statistically significant difference can be identified between administrative staff, nurses and paramedical personnel. This can also be noticed as well for pharmacists in comparison to nurses and paramedical staff. However, does not appear to be a statistically significant difference between dentists and other groups. Therefore, dentists, according to the above analysis, they are the least interested type of health professionals on the insurance provider of the patient.

The following variable for examination is the needs for access of health professionals to patient's medical information. Consistent with Table 3 below, the healthcare information which is considered to be very important is the patient's medical history, because participants replied that they agree or strongly agree concerning the requirement for access (87.5%). The need for information on medication history follows closely (85.9%). In contrast, the least important health data are those concerning insured service limits and annual usage (64.2%)

Table 75 *Needs of health professionals' concerning healthcare information (%).*

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Medical history	4.6	4.3	3.6	17.1	70.4
Diagnosis history	3.3	4.9	6.3	20.1	65.5
Medication history	5.3	4.3	5.6	19.4	65.5
Hospitalization history	4.3	5.3	7.6	21.4	61.5
Current medication	3.9	4.9	5.3	17.8	68.1
Examination results	3.9	4.6	5.9	16.4	69.1
Insurance provider	4.9	9.9	14.8	22.7	47.7
Insurance coverage of services	4.9	7.9	19.7	25.0	42.4
DRGs	4.9	8.6	18.4	26.0	42.1
Insured service limits and usage	6.6	12.5	16.8	26.0	38.2

According to healthcare professionals' responses, patients should be able to access their medical records. As reflected by Figure 2, health professionals agree or strongly agree that if patients had access to their medical records, it would be easier for them to search for a doctor (78.95%), while at the same time, this process will encourage patients to schedule an appointment with a doctor and expedite this action (81.57%). On the other hand, health professionals are not completely convinced that patients will benefit from searching the history of their medical records (68.42%).

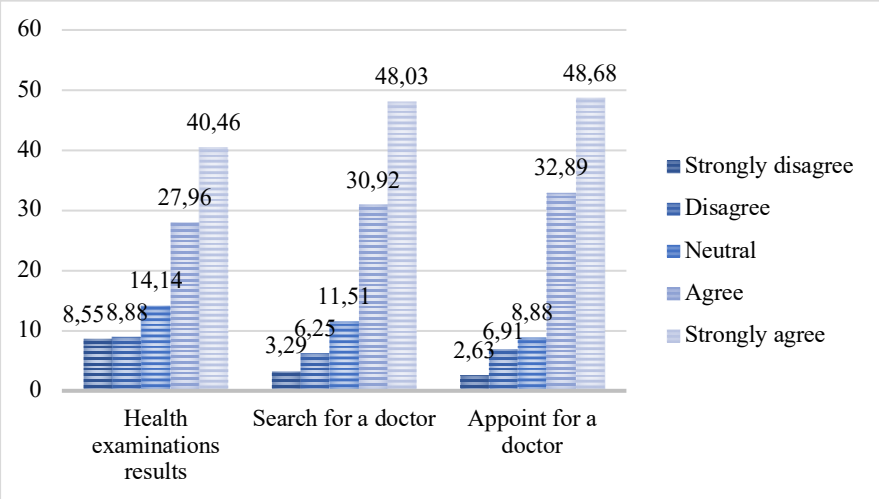

Figure 2 *Benefits for patients' while having access to health information systems (%).*

As concluding from above results the development of an integrated information system that will be able to provide information not only to healthcare professionals but to patients as well is necessary. The implementation of this kind of healthcare information system will also offer a unified digital channel of communication, which will reinforce the interaction between health professional staff and patients.

5.10. Discussion

The aim of our research was to assess health professionals' views on the adoption and value of health ICTs and to analyse their usage in Greece.

Our research findings showed that 92.11% of the hospitals in the sample are hosting an HIS. However, only 52.7% of the hospitals and health centers in Greece have a fully developed health care information system, including an electronic health record (EHR), and just 8.1% of them have any type of internet-enabled applications (Tsaklakidou et al., 2007). In addition, the health care organizations have progressed with the deployment of numerous types of information systems available from different vendors, without major concerns regarding information sharing, cross-operability, or integration with the current working systems. The latest reformations in the Greek health care system took place in 2010, although these were mainly focused on financial and organizational aspects. Admittedly, the lack of technical skills and development of a uniform information system causes problems in information flow (Economou et al., 2015). Consequently, the Greek Ministry of Health must move toward the development, implementation, and administration of comprehensive national standards for the design, competence, and use of EHR systems (Bowman, 2013; Ward, 2013).

Furthermore, our findings showed that 88% of personnel employed in the health sector declared that they were familiar or very familiar with the use of information systems, whereas 86.18% of the respondents believed that the adoption of HIS is extremely important, and 88.8% of them reported a high or very high frequency of usage in their workplace. In a relative study, researching the end users' (employees' and physicians') attitudes toward the introduction of e-procurement procedures in Greek public hospitals, the vast majority (93.7% of the employees and 89.4% of the physicians) answered that the introduction of e-procurement into public hospitals is indispensable; this finding is also confirmed in the literature (Economou et al., 2017; Posiopoulos et al 2013).

The intention to use the EHRs is a function of many variables (i.e., gender, age, and educational level). According to our findings, older health professionals and those with a lower level of education seemed to have lower levels of ability to adapt to information systems. At the same time, nurses, dentists, and health practitioners also have lower levels of ability to use information systems, although there is no correlation with administrative officers. The same findings are reported in various studies (Konttila et al., 2019; Hübner et al., 2010).

In our factor analysis, the health professionals' ability to use information systems exported five factors: information systems advantages, information on patients' medication history, ability to use information systems, patients' access to data, and information on patients' insurance. In another study, the authors reported that the health care workforce intends to use the EHR once they understand that it is easy to use and how useful it is for their work progress. Finally, knowledge about searching for and locating health information, the ability to show awareness and comprehension of health information, and the capacity to retain, process, and apply information are among the necessary components and properties that the health care workforce identified as critical. Hence, combining these components will assist medical professionals in effectively searching for, comprehending, and using health insights within the health care environment (Jordan et al., 2013).

The adoption of information systems by health organizations can have many positive effects. According to most of the health professionals who participated in our study, improvement in efficiency is the most important positive effect of information systems (91.1% agree or strongly agree). Other studies have highlighted additional positive effects of HIS, such as the promotion and functional chronic disease administration in medically underprivileged communities;[22] suitability for use of applications for social, language/literateness, and anthropological aspects among one or more weak populations (Gibbons, 2011); changes in clinical processes and positive improvement in specific patient outcomes (Jamal et al., 2009); and potential benefits in facilitating patients' self-management (Or & Tao, 2014). These advantages support the goal of helping all patients to be informed, active participants and to increase the quality of their own care (Pratt et al., 2006; Andreassen et al., 2015). Innovations in medical care in various health environments imprint the data effectiveness of strategic implementations and feed data back into the loop of innovation (Bunti et al., 2011) as well as improve organizational and performance cost (Ward, 2013; Haluza & Jungwirth, 2015).

However, as our findings suggest, health professionals highlighted the need for integrated information systems, because there is no connection or information exchange between various (clinical and administrative) information systems installed, a barrier for the effective improvement of the health care system.

Same barriers were also presented in various other studies, such as the complex relationship between different technical, social, and organizational dimensions identified in the health care sector.[29] Thus, we conclude that without successful integration of HIS into the clinical workflow, clinicians in today's ambulatory care settings will continue to resist adoption and implementation of EHR technology (Bowens et al., 2010; Mukred et al., 2019). Other various studies regarding the acceptance of health professionals of HIS unveiled similar adoption factors, such as facilitating conditions, computer usage concern, and self-efficacy. In addition, other important factors are training, service quality, expected risk and information probity, and anticipated risks for professional independence. These characteristics were found to be closely related to impact factors, empowered indirectly with the ability to influence the use of health information systems (Schaper et al., 2007; Tung et al., 2008; Aggelidis & Chatzoglou, 2009; Gagnon et al., 2012; Sezgin & Yıldırım, 2014).

Finally, cloud-based computing in health care can bring a about a revolutionary transformative change in the health care landscape, facilitating an evolution in the practice of medicine, enabling personalization of treatment, and helping to reduce the cost of health care (Hassanalieragh et al., 2015). Simultaneously, the entry and storage of administrative and clinical big data has the potential to transform medical practice by using information created daily to enhance the quality and competence of medical care (Murdoch & Detsky, 2013). Thus, the development of integrated information systems has the ability to amplify the interaction between public health professionals and patients. Consequently, this can be a crucial factor in the development and modernization of health services.

5.11. Conclusions

The results of our research indicate the need for the familiarization with health ICT usage, because, taking into account current circumstances, there is a high possibility of underutilization of sources. First, because older health professionals have lower levels of familiarization, special training programs should be organized. Such training programs should optimize both the use of the systems and the use of data (Ajuwon & Rhine, 2008). The older

health professionals' motivation for training will not be particularly difficult, as in the above analysis, we have already seen that as age increases, the benefits of ICT are more understood.

Furthermore, based on the above equation, we see that the ability to use health ICTs is lower for nurses, dentists, and health practitioners. This could have the same negative results as indicated for older health professionals. In this case, special training programs should focus on the specific needs of each category.

The training programs could be of in-service type and should be organized in a way that will provide the above categories of health professionals with expertise in both health information management and the use of ICT applications. In this way, both a higher level of effectiveness will be acquired and the existing knowledge divide will be bridged (Ajuwon & Rhine, 2008).

Additionally, from the point of view of ethical consequences, security and privacy are some of the major concerns while implementing health care systems. A cloud-based HIS should be built to maintain privacy and security of medical data (Zhang et al., 2018), in particular, the enforcement by the EU of the GDPR, which was designed to comply with data privacy laws across Europe. Organizations should revise their methods of storing data and maintain data privacy by using encryption in their systems (Al Omar et al., 2018; European Commission; 2020).

Finally, it is worth mentioning that the frequency of changes implemented in the health system is rather slow because of the insecurity that prevents the creation of a comprehensive policy. However, there is a clear need to introduce ICTs in the health sector, so the first tentative steps are already being taken to provide better health services. Because of the lack of implementation of integrated information systems in the NHS of Greece, the disruption in the provision of health care services resulted in reduced efficiency and the inefficient use of financial resources (Pothos et al., 2014; Economou et al., 2017).

From the above results, it can be concluded that during this digital era, it is mandatory for health professionals to have electronic access to the medical records of their patients through an integrated information system. Healthcare is a multifaceted system made to contribute to the prevention, diagnosis and treatment of health issues or injuries in human beings. This way, health professionals can have a complete view of the past and present condition of a patient through their record. They can view previous and current medical examinations, prescribed

medication, past surgeries, chronic conditions and medical opinions from their colleagues who had previously seen the patient. A paperless electronic medical record can assist in improving healthcare by connecting the medical staff and patients in healthcare decisions (Lester, 2016). As the research findings suggest, health professionals are mostly interested in having access to a patient's insurance provider and medical examination results; this is also confirmed by the literature (Dash et al., 2019; Jacobs and Popma, 2019). Taking into consideration above information, a patient's medical records, examination results, medical treatment and prescribed medicines need to be recorded. According to the responses received from professional healthcare staff, it would be helpful for patients to access their medical records and healthcare information since this option has the ability to assist their treatment, help them better acknowledge possible health disorders as well as to ensure that they are following their suggested treatment. According to the literature, the opportunity for patients to view their medical records can assist them in better understanding their healthcare (Ancker et al., 2017; Wolff et al., 2017).

Consequently, healthcare professionals should have access to a unified health information system where they can access and update the medical records of their patients'. In addition, the implementation of this kind of system will enable insurance providers to access and study medical data, with the intention to provide quality services. One of the most fundamental components of this information system will be the database. Hence, the following suggested Entity Relationship Diagram (ERD) describes an information system database which should include all required data for healthcare professionals and patients.

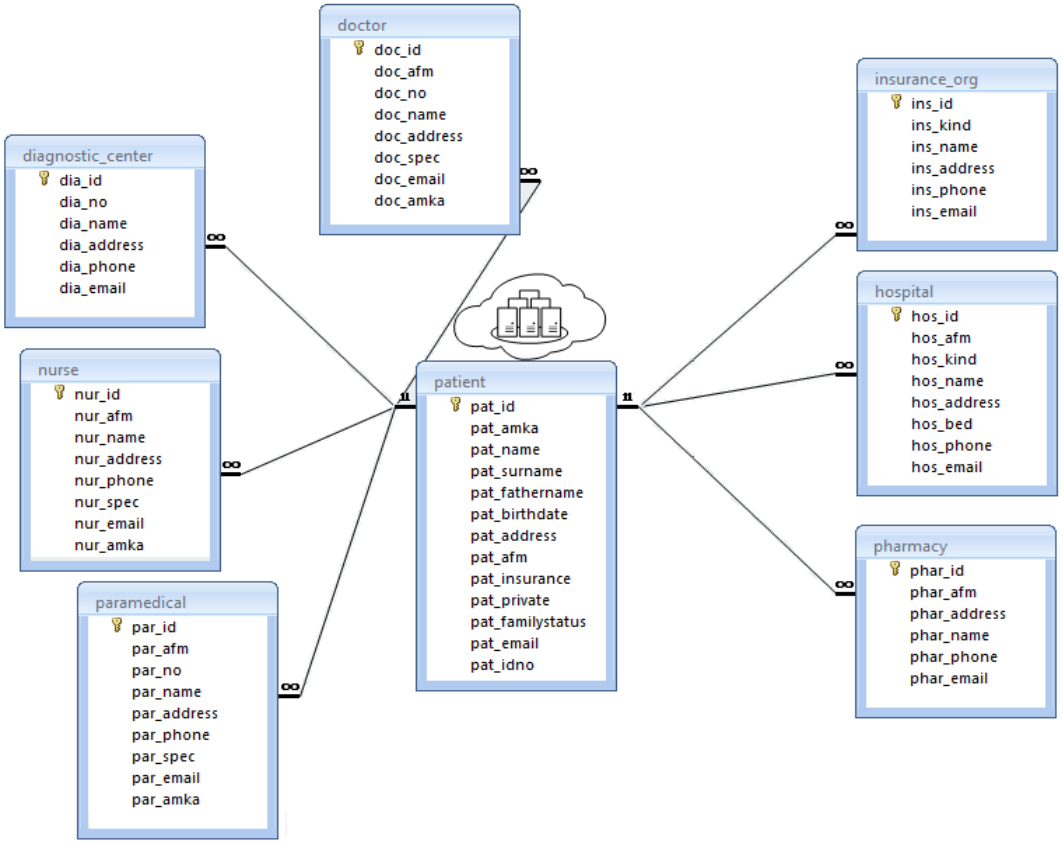

Figure 3 *ERD displaying suggested healthcare data.*

In Figure 3 above, a suggested database structure is presented. Within this ERD (Entity Relationship Diagram), there are 8 tables representing each suggested entity, which were designed after using a database normalization process. These 8 tables are intended to store data for each health professional, hospital or diagnostic centre a patient will need to visit for medical examinations. This process provides the advantage of creating a high-quality database design to achieve optimum data storage, management and maintenance. In each table, there is a field that will store key records to separate one record from the other, while numerous other data will be stored in different fields depending on the demands of the information flow and system specifications.

An implementation of a unified cloud-based healthcare information system will provide additional benefits for patients by employing the technologies of big data and machine learning. Forecasting models can be built based on accumulated information and help patients in a preventive way by evaluating the effects of different modelling methods (Du et al., 2020). Healthcare prediction is an additional data analytics method meant to reduce medical costs.

Predictive methods can be employed by studying medical records to estimate potential health risks and forecast future medical treatments in advance (Alkhatib et al., 2016).

However, the matter of privacy should also be considered. Patients' data should be encrypted, and at the same time, only designated users should be allowed to access them. This could be achieved by data governance. This is a procedure enforced by the authorised organization, which handles responsibilities, maintenance tasks and control over data. This content should be aligned using the outline shaped by the General Data Protection Regulation (GDPR). The most critical aspect is to maintain data within its original source, throughout the entire life cycle of the data (Jacobs and Popma, 2019). Therefore, the integrated system should be able to ensure that access to sensitive information is in accordance with legal and technical prerequisites (Ancker et al., 2017; Abouelmehdi et al., 2017). Nevertheless, despite individual security issues, health information systems also introduce the opportunity to design electronic health records with combined access standards and other privacy and security features that will allow the selected disclosure of specific health information (Rothstein and Talbott, 2017).

6. Conclusion and further research

In modern healthcare applications, the efficiency and ease of information availability is the main target of each implementation. Though, during implementation, an important factor should also be considered, this is the privacy and medical confidentiality of patients' data. Therefore, healthcare information is advised to be organized and structured in a way which will facilitate access and usage of healthcare professionals and patients as the same time.

Healthcare information systems are used to gather a series of data, to process and store crucial medical data and eventually to convert data to useful information for healthcare professionals. Therefore, it is necessary for every healthcare organization to be equipped with an intergraded healthcare information system which will facilitate access to latest medical information to support all healthcare personnel and administrative procedures.

This research aims to explore and understand the requirements of health professionals about the usefulness of medical information. As the analysis suggested, the data concerning the insurance provider of patients' is the type of information which is mostly accessible. Additionally, the biggest share of healthcare professionals considers in a positive way the access of patients to their medical data. This will enable patients to view their examination results, search and arrange an appointment with doctors.

Further research should be focused on the integration of information systems and explore the benefits from this implementation. Since unified data can provide an uninterruptable flow of information among key entities. Combining all healthcare information systems to one, we have the ability to construct a national healthcare information system able to handle information in a well-organized way. Further processing of the data with modern techniques can provide valuable information to explain diseases in specific geographical areas, create forecasting models and help patients in a preventive way. These abilities are strong motives for the development of a national healthcare information system, which will focus on the patients' needs and provide optimal services.

6.1.Managerial Implications

Health professionals highlighted the need for integrated information systems, lack of connection or information exchange between fragmented information systems is a barrier for the effective improvement of the health care system. According the majority (91.1% agree or strongly agree) of health professionals who participated in the survey, improvement in efficiency is the most important aspect of information systems. The development of unified information systems will assist medical professionals in effectively using health insights within the health care environment.

6.2.Conclusions and Detailed Academic Examination of the Imperative for Integrated Health Information Systems

The integration of Health Information Systems (HIS) represents a transformative force in the modern healthcare landscape, fundamentally reshaping how care is delivered, managed, and optimized. These systems have become indispensable tools in the era of digital healthcare, offering profound enhancements to the quality and efficiency of care. This extensive discussion delves into the multifaceted benefits of HIS, highlighting their pivotal role in contemporary healthcare settings and the crucial aspects of their design, implementation, and impact on various stakeholders.

6.2.1. Comprehensive Patient Care through Data Integration

One of the core advantages of HIS is their capability to consolidate a patient's entire medical history into a single, accessible repository. This integration goes beyond basic medical records to encompass detailed information about past diagnoses, ongoing treatments, surgical histories, chronic conditions, and medication regimes. By providing healthcare professionals with access to this comprehensive data repository, HIS allow for a holistic understanding of the patient’s health narrative. This not only enhances the personalization and accuracy of care but also significantly impacts patient outcomes by enabling more informed healthcare decisions.

The essence of integrated HIS lies not just in storing vast amounts of data but in their ability to make this data accessible and useful in real-time clinical environments. The availability of such detailed and comprehensive patient information helps eliminate redundancies in testing and treatment, reduces the likelihood of medical errors, and facilitates a more effective care coordination among various healthcare providers.

6.2.2. Augmenting Healthcare Decision-Making

HIS play a critical role in elevating the standard of healthcare decision-making. By providing immediate, up-to-date access to crucial patient information—such as detailed medical histories, insurance details, and recent diagnostic results—these systems enable healthcare providers to make more accurate, evidence-based clinical decisions. This rich data availability is instrumental in guiding healthcare providers toward optimal clinical outcomes, extending from acute medical interventions to long-term healthcare planning and disease management strategies.

The impact of enhanced decision-making facilitated by HIS is far-reaching. For instance, in emergency medical scenarios, the ability to quickly access a patient's comprehensive medical history can be life-saving. Additionally, in chronic disease management, having detailed patient records can help in crafting personalized treatment plans that account for an individual's entire medical history, lifestyle, and other factors.

6.2.3. Empowering Patients through Information Accessibility

Another transformative aspect of integrated HIS is the empowerment of patients through enhanced access to their health records. This direct access fosters a more engaged, informed, and proactive approach to personal health management. Patients who can review their medical records are more likely to understand their health conditions better, adhere to treatment plans, and actively participate in their healthcare decisions.

Research underscores a positive correlation between patient access to health records and improved health literacy, compliance with medical recommendations, and overall health outcomes. This accessibility not only supports better individual health management but also encourages a shift towards more transparent and collaborative healthcare practices, where patients and providers work together in managing health issues.

6.2.4. Streamlining Communication in Healthcare

Integrated HIS also establish a seamless digital communication pathway between healthcare providers and patients. This unified communication channel is crucial for ensuring a consistent and accurate exchange of health information, which in turn, leads to synchronized healthcare strategies and decisions. The importance of this streamlined communication extends beyond

individual patient care to encompass broader aspects of healthcare management, including coordination among different healthcare providers, efficient handling of medical emergencies, and continuity of care across various healthcare settings.

For example, a unified HIS can facilitate the sharing of patient data across specialists, primary care physicians, and ancillary services, ensuring that all parties have access to the same information. This reduces the risk of conflicting treatments or duplicative testing, ultimately enhancing the efficiency and effectiveness of healthcare delivery.

6.2.5. Technical Considerations and Database Management

The development of an integrated HIS requires a sophisticated and meticulous approach to database design and management. A well-structured Entity Relationship Diagram (ERD) is essential for mapping the complex interrelationships among various healthcare entities. This ERD forms the backbone of the HIS, facilitating efficient data storage, retrieval, and management. The design and implementation of such a database should prioritize not only operational efficiency but also scalability, security, and compliance with healthcare regulations and data protection laws.

6.2.6. Challenges and Future Directions

While HIS offer numerous benefits, their implementation is not without challenges. Issues such as data security, patient privacy, and the need for constant updates and maintenance can pose significant hurdles. Additionally, the integration of HIS with existing healthcare infrastructures requires careful planning and significant investment.

Looking forward, the future of HIS is likely to be shaped by advancements in technology such as artificial intelligence (AI) and machine learning. These technologies promise to enhance the capabilities of HIS by enabling more sophisticated data analysis and predictive modeling, which could lead to even more personalized and preemptive healthcare solutions.

The deployment of integrated Health Information Systems is a critical component in the evolution of healthcare practices. These systems offer comprehensive benefits, including enhanced healthcare decision-making, patient empowerment, streamlined communication, and operational efficiency. As healthcare continues to advance, the role of integrated HIS will

become increasingly central, necessitating ongoing research, development, and refinement to meet the evolving needs of the healthcare sector. The implementation of HIS is not just a technological upgrade but a fundamental shift towards a more informed, efficient, and patient-centered healthcare paradigm.

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8. Appendix

8.1. Glossary

1. **3D Bioprinting**: The use of 3D printing–like techniques to combine cells, growth factors, and biomaterials to fabricate biomedical parts that maximally imitate natural tissue characteristics.
2. **Accountable Care Organization (ACO)**: Groups of health care providers, who give coordinated care, chronic disease management, and thereby improve the quality of care patients get.
3. **Adverse Event**: An unintended physical injury resulting from or contributed to by medical care, which requires additional monitoring, treatment or hospitalization, or that results in death.
4. **Ambulatory Care**: Care provided in outpatient settings.
5. **Application Programming Interface (API)**: A set of rules and protocols for building and interacting with software applications.
6. **Artificial Intelligence (AI)**: The simulation of human intelligence processes by machines, especially computer systems.
7. **Benchmarking**: Comparing one's business processes and performance metrics to industry bests or best practices from other industries.
8. **Big Data**: A term that describes the large volume of data – both structured and unstructured – that inundates a business on a day-to-day basis.
9. **Biometrics**: The measurement and statistical analysis of people's unique physical and behavioral characteristics.
10. **Blockchain**: A digital ledger in which transactions made in bitcoin or another cryptocurrency are recorded chronologically and publicly.
11. **Bring Your Own Device (BYOD)**: The policy of permitting employees to bring personally owned devices to their workplace, and to use those devices to access privileged company information and applications.
12. **Business Intelligence (BI)**: A technology-driven process for analyzing data and presenting actionable information to help executives, managers and other corporate end users make informed business decisions.
13. **Chronic Disease Management**: An integrated care approach to managing illness which includes screenings, check-ups, monitoring and coordinating treatment, and patient education.
14. **Clinical Decision Support (CDS)**: Health information technology system that is designed to provide physicians and other health professionals with clinical decision support, that is, assistance with clinical decision-making tasks.
15. **Clinical Documentation Improvement (CDI)**: A process used by healthcare providers to review clinical documents and improve the quality of medical records.
16. **Cloud Computing**: The delivery of different services through the Internet, including data storage, servers, databases, networking, and software.
17. **Compliance**: Conforming to a rule, such as a specification, policy, standard or law.
18. **Computerized Physician Order Entry (CPOE)**: A process of electronic entry of medical practitioner instructions for the treatment of patients.
19. **Confidentiality**: Ensuring that information is accessible only to those authorized to have access.

20. **Continuity of Care Record (CCR)**: A health record standard specification developed jointly by ASTM International, the Massachusetts Medical Society (MMS), the Healthcare Information and Management Systems Society (HIMSS), the American Academy of Family Physicians (AAFP), and the American Academy of Pediatrics (AAP).
21. **Cybersecurity**: The practice of protecting systems, networks, and programs from digital attacks.
22. **Data Analysis**: The process of inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, informing conclusions, and supporting decision-making.
23. **Data Integration**: The process of combining data from different sources into a single, unified view.
24. **Data Mining**: The practice of examining large pre-existing databases in order to generate new information.
25. **Data Privacy**: The aspect of information technology that deals with the ability an organization or individual has to determine what data in a computer system can be shared with third parties.
26. **Data Security**: The process of protecting data from unauthorized access and data corruption throughout its lifecycle.
27. **Data Silos**: Sets of data that are isolated or live in separate systems, making it difficult to pool data for shared insights.
28. **Data Warehouse**: A large store of data accumulated from a wide range of sources within a company and used to guide management decisions.
29. **Digital Health**: The convergence of digital technologies with health, healthcare, living, and society to enhance the efficiency of healthcare delivery and make medicine more personalized and precise.
30. **Digital Imaging and Communications in Medicine (DICOM)**: The international standard to transmit, store, retrieve, print, process, and display medical imaging information.
31. **Disease Management**: An organized, proactive, multicomponent approach to healthcare delivery for specific diseases.
32. **Distributed Ledger Technology (DLT)**: A digital system for recording the transaction of assets in which the transactions and their details are recorded in multiple places at the same time.
33. **E-Health**: The use of information and communication technologies (ICT) for health.
34. **Electronic Data Interchange (EDI)**: The computer-to-computer exchange of business documents in a standard electronic format between business partners.
35. **Electronic Health Record (EHR)**: A digital version of a patient's paper chart.
36. **Electronic Medical Record (EMR)**: The systematized collection of patient and population electronically-stored health information in a digital format.
37. **Electronic Prescribing (e-Prescribing)**: The use of health care technology to prescribe medication directly from the point of care to a pharmacy.
38. **Encryption**: The method by which plain text or any other type of data is converted from a readable form to an encoded version that can only be decoded by another entity if they have access to a decryption key.
39. **Evidence-based Medicine (EBM)**: An approach to medical practice intended to optimize decision-making by emphasizing the use of evidence from well-designed and well-conducted research.

40. **Genomics**: The study of all of a person's genes (the genome), including interactions of those genes with each other and with the person's environment.
41. **Geographic Information System (GIS)**: A framework for gathering, managing, and analyzing data. Rooted in the science of geography, GIS integrates many types of data.
42. **Health Information Exchange (HIE)**: The mobilization of health care information electronically across organizations within a region, community or hospital system.
43. **Health Information Management (HIM)**: The practice of acquiring, analyzing, and protecting digital and traditional medical information vital to providing quality patient care.
44. **Health Information Technology (HIT)**: The application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making.
45. **Health Level Seven (HL7)**: A set of international standards for transfer of clinical and administrative data between software applications used by various healthcare providers.
46. **Healthcare Analytics**: The branch of analysis that focuses on offering insights into hospital management, patient records, costs, diagnoses, and more.
47. **Healthcare Interoperability**: The ability of different information systems, devices, and applications to access, exchange, integrate, and cooperatively use data in a coordinated manner.
48. **HIPAA (Health Insurance Portability and Accountability Act)**: United States legislation that provides data privacy and security provisions for safeguarding medical information.
49. **Hospital Information System (HIS)**: A comprehensive, integrated information system designed to manage all the aspects of a hospital's operation.
50. **Immunization Registry**: A system used to collect and consolidate immunization data from multiple health care providers, provide clinical decision support to those providers, and contribute to surveillance efforts.
51. **Informatics**: The science of how to use data, information, and knowledge to improve human health and the delivery of health care services.
52. **Information Blocking**: Practices that unreasonably limit the availability, disclosure, and use of electronic health information.
53. **Interoperability**: The ability of different information systems, devices and applications to access, exchange, integrate and cooperatively use data in a coordinated manner, within and across organizational, regional and national boundaries.
54. **Internet of Things (IoT)**: The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.
55. **Laboratory Information System (LIS)**: A software system that records, manages, and stores data for clinical laboratories.
56. **Machine Learning (ML)**: An application of AI that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.
57. **Meaningful Use (MU)**: A set of criteria defined by the Centers for Medicare & Medicaid Services (CMS) Incentive Programs that governs the use of electronic health records and allows eligible providers and hospitals to earn incentive payments by meeting specific criteria.
58. **Medicaid**: A joint federal and state program that helps with medical costs for some people with limited income and resources.
59. **Medical Audit**: Systematic review of care against explicit criteria, followed by corrective steps.
60. **Medical Image Processing**: A technique and process of creating visual representations of the interior of a body for clinical analysis and medical intervention.

61. **Medication Therapy Management (MTM)**: Medical care provided by pharmacists whose aim is to optimize drug therapy and improve therapeutic outcomes for patients.
62. **mHealth**: Short for mobile health, the practice of medicine and public health supported by mobile devices.
63. **Natural Language Processing (NLP)**: A branch of artificial intelligence that helps computers understand, interpret and manipulate human language.
64. **Neural Networks**: A series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates.
65. **PACS (Picture Archiving and Communication System)**: Medical imaging technology which provides economical storage of, and convenient access to, images from multiple modalities.
66. **Patient Engagement**: A concept that combines a patient's knowledge, skills, ability, and willingness to manage their own care, with interventions designed to increase activation and promote positive patient behavior.
67. **Patient Portal**: A secure online website that gives patients convenient 24-hour access to personal health information from anywhere with an Internet connection.
68. **Patient-centered Care**: A healthcare approach in which patients are empowered to help manage their own care and health outcomes.
69. **Payment Model**: A strategy used to determine how providers are reimbursed for healthcare services provided, often based on metrics such as quality, efficiency, cost, and patient outcomes.
70. **Personal Health Record (PHR)**: An electronic application used by patients to manage their personal health information.
71. **Pharmacy Benefit Management (PBM)**: Companies that administer prescription drug plans for more than 266 million Americans.
72. **Population Health Management (PHM)**: A discipline within the healthcare industry that studies and facilitates care delivery across the general population or a group of individuals.
73. **Predictive Analytics**: The use of data, statistical algorithms, and machine learning techniques to identify the likelihood of future outcomes based on historical data.
74. **Preventive Care**: Routine healthcare that includes screenings, check-ups, and patient counseling to prevent illnesses, disease, or other health problems.
75. **Primary Care Physician (PCP)**: A healthcare professional who practices general medicine.
76. **Privacy Rule**: A federal regulation issued under the Health Insurance Portability and Accountability Act (HIPAA) which establishes national standards to protect individuals' medical records and other personal health information.
77. **Public Health**: The health of the population as a whole, especially as monitored, regulated, and promoted by the state.
78. **Quality Improvement (QI)**: A systematic, formal approach to the analysis of practice performance and efforts to improve performance.
79. **Radiology Information System (RIS)**: A networked software system for managing medical imagery and associated data.
80. **Real-world Data (RWD)**: Data derived from a number of sources that are associated with outcomes in a heterogeneous patient population in real-world settings.
81. **Regulatory Compliance**: Adherence to laws, regulations, guidelines, and specifications relevant to its business processes.
82. **Remote Patient Monitoring (RPM)**: A technology to enable monitoring of patients outside of conventional clinical settings.

83. **Secure Messaging**: A service that allows the exchange of private data between users.
84. **Security Rule**: A federal regulation that requires security for health information in electronic form.
85. **Smart Wearables**: Electronic devices that can be worn on the body, either as an accessory or as part of material used in clothing.
86. **Telehealth**: The distribution of health-related services and information via electronic information and telecommunication technologies.
87. **Telemedicine**: The remote diagnosis and treatment of patients by means of telecommunications technology.
88. **Usability**: The degree of ease a user has when utilizing a specific product or system.
89. **Value-based Care**: A healthcare delivery model in which providers, including hospitals and physicians, are paid based on patient health outcomes.
90. **Virtual Care**: A method that allows healthcare professionals to provide treatment to patients remotely via telecommunication technology.
91. **Virtual Reality (VR)**: A simulated experience that can be similar to or completely different from the real world.
92. **Wearable Technology**: Devices that can be worn on the body, either as an accessory or as part of material used in clothing.
93. **Wellness Program**: A program intended to improve and promote health and fitness that's usually offered through the work place.
94. **World Health Organization (WHO)**: A specialized agency of the United Nations responsible for international public health.
95. **e-Prescribing**: The use of health care technology to prescribe medication directly from the point of care to a pharmacy.
96. **mHealth**: Short for mobile health, the practice of medicine and public health supported by mobile devices.
97. **eHealth**: The use of information and communication technologies (ICT) for health.
98. **Health Level Seven (HL7)**: An international community of healthcare subject matter experts and information scientists collaborating to create standards for the exchange, management, and integration of electronic healthcare information.
99. **Clinical Decision Support (CDS)**: Health information technology system that is designed to provide physicians and other health professionals with clinical decision support (i.e., assistance with clinical decision-making tasks).
100. **Pharmacovigilance**: Also known as drug safety, it is the pharmacological science relating to the collection, detection, assessment, monitoring, and prevention of adverse effects with pharmaceutical products.
101. **Precision Medicine**: An emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle for each person.

8.2.Questionnaire

1. I am familiar with the use of a personal computer?

Disagree strongly	Disagree	Neutral	Agree	Agree strongly

2. I could do the following work using a pc:

Disagree strongly	Disagree	Neutral	Agree	Agree strongly
1	2	3	4	5

Please use the following scale

	1	2	3	4	5
Use of MIS for hospitals					
Use word					
Use excel					
Use database programs					
Use statistical analysis programs					
Use for finding science literature					

3. In my workplace I use pc:

.

Not at all	Almost never	Occasionally	Almost occasionally	Always

4. Does the hospital/Company you are working at has an information system?

	Yes
	No

5. Does the sector you are working at has an information system?

☐ Yes
☐ No

6. If yes, is the information system of your sector connected to the hospital information system?

☐ Yes
☐ No

7. The use of information system is crucial for the hospitals?

Disagree strongly	Disagree	Neutral	Agree	Agree strongly

8. What kind of information about the patients you have access to?

☐ Health medical record
☐ Medical diagnostics
☐ Medical therapy history
☐ History of medical nursing
☐ Current medications
☐ Medical results
☐ Insurance provider
☐ Insurance provider coverage – limits
☐ DRGs
☐ Insurance provider limits about year medical examinations

9. What kind of information about your patient would be important to have access to? 1 = Not at all important, 5 = Very important .

	1	2	3	4	5
Health medical record					
Medical diagnostics					
Medical therapy history					
History of medical nursing					
Current medications					

Medical results					
Insurance provider					
Insurance provider coverage – limits					
DRGs					
Insurance provider limits about year medical examinations					

10. How do you feel about patience having access to information systems in order to? 1 = Not at all important, 5 = Very important

	1	2	3	4	5
… search the results of their health examinations?					
… be informed about the history of their health examinations?					
… make an appointment with a doctor based on health history?					
… find a doctor?					

11. What do you think are the benefits of using integrated health information systems? 1 = Not at all important, 5 = Very important

	1	2	3	4	5
Improving the efficiency of administrative functions.					
Use of shared health information's about the patients.					

On – line access to information's about patient's health records.					
Improving the quality of services provided.					
Improving the efficiency of services provided.					
Support the organization changes.					
Support the functions based on the legislation standards.					
Transparency in financial management.					
Monitoring operation cost.					
Joint management supply.					

12.Sex:

- ☐ Male
- ☐ Female

13.Age:

- ☐ 18-35
- ☐ 35-45
- ☐ 45-55
- ☐ 55-65
- ☐ Over 65

14. Education level:

- ☐ Hight school
- ☐ Higher education
- ☐ University degree
- ☐ Master's degree

☐ Ph.D

15. Employment:

☐ Public Hospital
☐ Private Hospital
☐ Private clinic
☐ Other……

16.Speciality:

☐ Doctor
☐ Nurse
☐ Physician
☐ Administrative staff
☐ Pharmacist
☐ Dentist.

17. Comments

(You are free to add comments concerning the research or contact information in order to be notified about the results.)

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