

Impacts of Information and Communication Technology (ICT) and Healthcare Service Delivery in Akwa Ibom State: A Study of General Hospitals in Ikot Ekpene Senatorial District, Akwa Ibom State (2015-2022)

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ABSTRACT: This study investigates the impact of digital healthcare service delivery in General Hospitals in Ikot Ekpene Senatorial District, Akwa Ibom State, Nigeria. The research emanates from spread concerns over non-recognition of positive impacts of digital healthcare service delivery in the area. It points out two factors such as information and communication technology and patients' data management via ICT as major contributors to positive impacts of digital healthcare delivery. Despite efforts from government to upgrade the healthcare sector through digitalization, systematics problems such as poor use of ICT use, manual data management, and failure to recognized its impact has continue to hinder the healthcare system from reaping the positive impact of digital healthcare. The study utilized both survey and descriptive research designs. A structured questionnaire was employed to gather data from a sample of 203 respondents chosen from a total population of 425 staff using purposive, stratified, and simple random sampling techniques. Quantitative statistical methods specifically Chi-square test were used to analyse data at a 0.05 significance level to determine the relationship between independent variables (information and communication technology and digital patients' data management) and the dependent variable (healthcare delivery). The findings revealed that information and

communication technology have a statistically significant positive effect on healthcare delivery ($\chi^2 = 28.15$) leading to accuracy of patients' diagnosis, timely and efficient delivery of healthcare. Similarly, digital patients' data management ($\chi^2 = 27.97$) was shown to coordinate patient care across departments or facilities, reduce medical errors and improved patient safety especially in general hospitals. The study concludes that information and communication technology is crucial in modern healthcare delivery. It recommends modernization of healthcare system with current ICT equipment and creating awareness on the need to managed patients' data electronically.

Keywords: *Information and Communication Technology, patients' data management, Healthcare Delivery, Health Information Exchange*

INTRODUCTION

A major advancement in the healthcare sector is the adoption of Information and Communication Technology (ICT), which has become a pivotal element in modern healthcare delivery. The integration of ICT has transformed the way health services are accessed, managed, and provided across various environments. The healthcare sector has undergone transformation towards data-driven strategies which is aim at improving patient service care and management in the digital transformation epoch (Reyna, 2023). The transformation comprises of telemedicine, electronic health records, AI-driven diagnostics and mobile health application. Study by Semantha, Azam, Shanmugam, Yeo, and Beeravolu, (2021), which focused on the influence of ICT in healthcare service delivery revealed that the breakthrough in technologies has led healthcare service providers to increasingly implement Patient Record Management Systems (PRMS). This has help to streamline healthcare service providers' operations, improve data accessibility, and enhance accurate decision-making. Information and Communication Technology in healthcare service delivery covers planning, application, development, and maintenance of software and information systems fitted for the healthcare sector.

Beyond healthcare delivery, Information and Communication Technology (ICT) is instrumental in various sectors, including agriculture, education, transportation, manufacturing, and commerce. The effects of ICT on healthcare are multifaceted. On one hand, it has significantly increased access to healthcare services, particularly in remote and

underserved areas, enabling virtual consultations, remote monitoring, and mobile health interventions. Additionally, ICT has enhanced clinical decision-making through tools like real-time data analytics and predictive modeling, which also improve coordination among healthcare professionals. These innovations have led to fewer medical errors, reduced patient wait times, and overall improved health outcomes (Sethi and Gupta, 2022).

The rise of infectious diseases in the last few years has greatly accelerated the adoption of information and communication technology (ICT) in the delivery of healthcare. This was particularly achieved during the COVID-19 pandemic, which pressured health systems globally to more receptively adopt digital health solutions. The accelerated digitalization of healthcare services during this period pushed to the limelight both the promising benefits and the boundaries, as well as the dangers of fully digitalized healthcare service provision. Though a vast majority of healthcare providers utilized ICT to ensure continuity of services, the pandemic also unmasked underlying issues like digital disparity, infrastructural gaps, and cybersecurity threats (Keesara, Jonas, and Schulman, 2020; Atique, Bautista, Khan, and Thwin, 2023).

The adoption of Information and Communication Technology into healthcare service delivery has led to significant improvements but the outcomes are not invariably positive. Several obstacles which includes inadequate digital infrastructure, low health and digital literacy, concerns regarding patient data privacy and ethics, and ineffective health information exchange exist in the system. The above obstacles are predominantly experience within various Third World Countries (TWCs). The obstacles hinders the optimal integration of information and communication technology in healthcare service delivery. The aim of this study is to thoroughly examine the positive impacts of information and communication technology on healthcare service delivery within General Hospitals Ikot Ekpene Senatorial District. And in addition to processing the latest empirical findings and policy frameworks, this research aims at assessing how Information and Communication Technology has influenced current healthcare systems. It will also pinpoint essential steps vital for ensuring ICT ongoing inclusivity and sustainable integration in healthcare service delivery. The study will be guided by a set of specific objectives to achieve this aim:

Objective of the Study

The objective of the study includes the following;

- i. To examine the influence of Information and Communication Technology on healthcare service delivery in general hospitals Ikot Ekpene Senatorial District, Akwa Ibom State.
- ii. To assess the effect of patients' data management via Information and Communication Technology on healthcare service delivery in general hospitals Ikot Ekpene Senatorial District, Akwa Ibom State.

Research Hypotheses

- i. Information and communication technology has no significant influence on healthcare service delivery in general hospitals in Ikot Ekpene Senatorial District, Akwa Ibom State.
- ii. Patients' data management via Information and Communication Technology has no significant influence on healthcare service delivery in general hospitals Ikot Ekpene Senatorial District Akwa Ibom State.

Review of General Literature and Theoretical Framework

Concept of Information and Communication Technology

Information and Communication Technology (ICT) encompasses the utilization of digital tools and systems for the collection, storage, management, and sharing of information. It involves the integration of various technological resources designed to handle information and enhance communication. UNESCO (2018) defines ICT as a broad array of technological tools and resources that enable communication, creation, dissemination, storage, and management of information. O'Brien and Marakas (2011), depict Information and Communication Technology as an innovation which allow access to information through telecommunications. Information and communication technology underscoring its significance in connecting various people and systems across the globe. The advancement of Information and Communication Technology has remodel various societies into economies which are driven by knowledge and information or data. Economies where data has become one of the essential assets for various innovation and decision-making.

Importantly, Information and Communication Technology is the basic foundation of the modern information society especially in fuelling globalization and various digital transformation. Haddon (2017), noted that Information and Communication Technology does not only facilitates exchange of information or data management. ICT also capacitate persons and organizations to successfully generate, exchange, and use information. Information and Communication Technology renders important task spanning various sectors which includes; business, education, governance, and healthcare through enabling access to various information. This also fosters joints efforts to boosting productivity (UNESCO, 2018).

Concept of Patients' Digital Data Management

This is also known as Electronic Health Records (EHRs). Patients' Digital Data Management plays an important function in the current healthcare service delivery landscape. This is a result of the various innovations and advancements in Information and Communication Technology. We can see this in the use of digital files to capture patients' complete data which include their personal information, medical history, lab results, diagnoses results, and treatment plans. One crucial advantage of Electronic Health Records is the ability of the application to enhance healthcare service delivery coordination. This is because the medium ensures that healthcare professionals can access patient information when and where necessary. The Patients' Digital Data Management technology also reduces errors which are linked to handwritten data documentation. This eliminate unnecessary tests and procedures in such healthcare service delivery facility and leads to promotion of a more efficient allocation of available healthcare resources in such healthcare facility. Thus, Electronic Health Records empower healthcare service professionals to keep an eye on their patient progress, properly handle chronic illnesses by implementing preventative blueprint with superior productivities (Agarwal et al., 2020; Hickson et al., 2020).

The embracement of Electronic Health Records (EHRs) has substantially organized administrative functions in healthcare service delivery facilities which has minimized paperwork. This has enhanced billing precision and also enabled advanced medium for communication between healthcare service providers and their insurers. According to Buntin et al., (2020), regardless of the visibly seen odds of Electronic Health Records,

there still exist various challenges to be addressed. These challenges particularly concern data privacy with security, and also the necessity for all healthcare service professionals to embrace new technologies and innovations in the healthcare sector. One significant barrier for healthcare systems as experienced in developing countries is the issue of trust with patients' data. Preserving patient trust with data privacy is important for the effectiveness of the various innovations in healthcare system. In this regard if patients feel uncertain about the discreetness of their health data, they may choose to keep back some critical health data about themselves to healthcare professionals. Some patients may even resolve to leave the digital healthcare system entirely. These data should only be available to healthcare facilities and professionals on demand especially for those patient receiving medical care or treatment (Ganiga et al., 2020).

In Electronic Health Records (EHR) privacy of patient data post a serious problem. Easy accessibility of patient data via various medium such as mobile devices and other electronic platforms increases the chances of data privacy infringement. It is a necessity to safeguard documented and sensitive healthcare data with robust security measures. The reputations of a healthcare facility can be harm and also diminish patient trust if such facility fails to adequately protect their medical data. The issue of safeguarding patient data is so important to maintain confidentiality with patients and to ensure the sustained success of Electronic Health Records systems (Choi et al., 2018; Roehrs et al., 2019).

Concept of Health Information Exchange (HIE)

The transfer of healthcare data among healthcare professionals, clinicians, medical facilities, patients and other relevant parties is known as Health Information Exchange. When this is done with the use digital platforms via Information and Communication Technology, it is known as Digital Health information Exchange. According to Hägglund, et al (2017), Health Information Exchange Health Information Exchange generally involves the digital sharing of medical data among various healthcare service institutions and their affiliated hospitals within an area and beyond. The data exchange significantly influences quick access to health information by clinicians who need them. It also provides healthcare providers with timely and precise acumen into patient health records, treatments plans, and various conditions. This helps to minimize needless repetitions of medical tests and imaging procedures. Thus, Health Information Exchange contributes to reduced

healthcare service expenses by patients while upgrading the quality of care from healthcare facilities (Everson et al., 2016).

The positive impacts of Digital Health Information Exchange in the current healthcare service delivery is vast. These ranges from equipping healthcare professionals with complete, accurate, and real-time discernment into their patient's health history. This helps to foster a better coordination of care that leads to lowering the risk of unnecessary medical errors. It also ensures that patients' treatment plans are structured accurate reliable data. This can be seen in West et al., (2020), when they opined that a patient relocating or seeking a specialist's care can avoid overlooked diagnoses, conflicting treatments, or unnecessary medical procedures because Health Information Exchange allows their health records to accompany them smoothly to various locations.

Ability to significantly improve patient safety is another impact of Health Information Exchange (HIE). Healthcare providers are able to make better-informed decisions, reduces unnecessary procedures, and respond more quickly in case of emergencies. This is because Health Information Exchange grant healthcare service providers with real-time access to various health records. Having access to patient's medical history can be very important and ensuring patients receive timely and appropriate healthcare service regardless of where they are located especially in critical scenarios such as when patients are brought to hospital emergency rooms (Fitzgerald et al., 2021).

Health Information Exchange is also crucial for managing general population health far beyond perfecting individual patient's care. Health Information Exchange helps to track public health trends, identify at-risk groups, and also assist in creating public healthcare policies tailored towards improving health outcomes by gathering data from various healthcare service providers and regions. By enabling data sharing among healthcare workers, researchers, and public healthcare agencies, Health Information Exchange fosters research, which as contributed to evidence-based practices and innovations in the healthcare sector (Gautam et al., 2020).

The implementation of Electronic Health Records (EHRs) by various healthcare institutions Health Information Exchange (HIE) has gained momentum. It facilitate more efficient ways to sharing of information within defined networks and across different

organizations and the systems can be classify into intra and inter system types (Zhang, Han, and Tang, 2017). Effective communication through Health Information Exchange especially during public health crises like pandemics is essential. It helps foster prompt diagnosis, suppressing disease transmission, and ensuring that patients receive the necessary care they need during such pandemics. Disseminating real-time data among regions and healthcare providers with applications of information and communication technology (ICT) through use of social media analytics and Geographic Information Systems have played a crucial role in disease surveillance and prevention (Addo and Agyepong, 2020).

For granting the smooth transfer of medical information among healthcare service providers and institutions, Health Information Exchange via Information and Communication Technology has greatly improves patients' care. Patients experienced consistent and coordinated care as guaranteed by the information sharing that even when consulting various specialists or transitioning between healthcare environments the experience remain the same. Immediate access to crucial patient data which includes lab results, medical history, and treatment plans through effective use of Health Information Exchange systems enhance clinical decision-making and reduces risks which are related to incomplete or delayed information. Wagstaff (1986), noted that good access to information and innovation complement with improved health result which the traditional production function in healthcare service delivery indicates.

Health Information Exchange does not only intensify the delivery and quality of care. It also results in cost efficiencies by eliminating the need for redundant tests or treatments.

Health Information Exchange systems ensures that patient information is securely exchanged across various systems. This promotes better communication, reducing medical errors, and enhance patient satisfaction as the healthcare sector is increasingly leaning towards integrated care models.

Information and Communication Technology (ICT) and Healthcare Service Delivery

Information and Communication Technology (ICT) enables real-time access to medical information which has significantly boosts collaboration among healthcare professionals, patients, and administrators thereby ultimately leading to better clinical decision-making

and improved patient outcomes (World Health Organization, 2020; Lee et al., 2020). The evolution of Information and Communication Technology in the healthcare sector began in the late 20th century with the transformation from manual paper records to digital health records. Problems like miscommunication, missing records, and inefficient healthcare management were initially as a result of healthcare workflows which depended heavily on paper-based documentation. However, facilitating easier data sharing and access across various medical facilities is as the rise of digital technologies which has allowed healthcare providers to store patient information more securely. Tackling major healthcare challenges such as fragmented care, communication failures, and inefficiencies in both clinical and administrative proceedings is as a result of transition to electronic healthcare systems which has set the stage for more sophisticated technologies (Buntin et al., 2020).

Electronic Health Record (EHR) system is one of the most impactful digital tools in the realm of healthcare Information and Communication Technology. Electronic Health Records represent digital records of patients' medical histories. This enables healthcare professionals to effortlessly have access to, update, and share crucial healthcare information across various healthcare platforms. Electronic Health Records (EHRs) systems also play a crucial role in reducing medication errors, eliminating unnecessary tests, and improving clinical decision-making by supplying real-time health data. It does not only augment care coordination by offering a complete view of a patient's medical history (Agarwal et al., 2020). Electronic Health Records has more healthcare organizations embrace it which has made the systems become essential for boosting patient safety thereby promoting more efficient healthcare delivery system. Electronic Health Record systems has facilitated quicker diagnoses and better-informed treatment strategies by optimizing how patient information are collected and shared (Hickson et al., 2020).

Telemedicine is an important element of Information and Communication Technology in healthcare service delivery. It enables patients to consult healthcare professionals remotely which minimizes the need for physical visits of patients to healthcare facilities. Patients in rural and underserved communities where access to healthcare services is often limited are the greater beneficiaries of this medical approach. Telemedicine enhances access to care and lowers travel and appointment costs with remote consultations. The use of telemedicine significantly increased as healthcare service providers turned to virtual

consultations to maintain services while following social distancing guidelines during the COVID-19 pandemic. Particularly for the management of chronic illnesses and decreasing hospital readmissions the ongoing expansion of telehealth platforms which includes telemedicine, remote monitoring, and virtual care is anticipated to remain crucial in healthcare (Buchan et al., 2020; Smith and Nelson, 2021). Patients are enabled to take charge of their health right from their smartphones with the help of mobile health apps which have become an important tool in the realm of Information and Communication Technology,.

These mobile apps helps users to monitor vital body signs, managing chronic illnesses, and following their prescribed treatment plans. Additionally, these apps enhances patient engagement and encourages effective self-management since they function as platforms for health education by offering lifestyle tips and personalized care strategies in general (Sharma et al., 2021). Information and communication technology also hold important promise for improving healthcare outcomes especially for those facing barriers to traditional healthcare services by utilizing their mobile technology. Furthermore, it allows for healthcare professional timely interventions when needed because of its role in remote patient monitoring supplying healthcare providers with real-time insights into patients' conditions Information and Communication Technology (ICT) plays an important role in shaping global economies while improving business processes and enhancing competitive advantages which means it extends far beyond healthcare sector. ICT broadens organisations capabilities and streamlines various operations which make it essential for organizations to thrive. ICT provides a competitive edge in the healthcare sector by boosting operational efficiency. This helps to foster better communication among stakeholders and supporting data-driven decisions in healthcare. Making them more inform about the needs of both patients and providers increases much dependency on internet-enabled and mobile technologies. This underscores the critical importance of Information and Communication Technology in updating healthcare systems (Mastilo, 2017).

Influence of Information and Communication Technology on Healthcare Service Delivery in General Hospitals Ikot Ekpene Senatorial District, Akwa Ibom State, Nigeria

The integration of Information and Communication Technology (ICT) has transformed the healthcare landscape significantly. This result in boosting healthcare sector efficiency,

accuracy, and timeframe of healthcare service delivery. Information and Communication Technology tools such as Electronic Health Records (EHRs) and telemedicine platforms have greatly influence communication and coordination along with patients' data management within healthcare systems. The ICT innovations in healthcare service delivery are important for tackling medical challenges like medical errors, disjointed care, and treatment delays (Vardoulakis et al., 2021). Agarwal et al., (2020), agreed that healthcare professionals can access current patient data rapidly via digitizing medical records which leads to a more informed decisions and enhanced patient safety. Telemedicine has emerged as a game-changer. Particularly in rural or underserved regions in remote consultations which reduces the necessity for face-to-face hospital visits and broadening healthcare access in Ikot Ekpene Senatorial District, Akwa Ibom State, Nigeria. Telemedicine was key in ensuring uninterrupted care especially during the COVID-19 pandemic where healthcare systems were under severe strain (Smith and Nelson, 2021).

The incorporation of Information and Communication Technology in healthcare has made it possible for continuous monitor of patients. This innovation has help healthcare providers to keep an eye on persons with chronic illnesses through mobile health apps and wearable technology. Through these devices healthcare professionals get notification of potential vital health signs such as blood pressure and glucose levels before they escalate (Sharma et al., 2021). Better health outcomes especially for patients with long-term conditions and facilitating early interventions are capacity that greatly improves proactive care management. The adoption of digital Patient Record Management Systems (PRMS) has enhanced healthcare service delivery by centralizing patient information. This makes it easier for healthcare institutions and teams to access and share data which resulting in collaboration while reducing the probability of errors. Healthcare practices are becoming more personalized with superior patient care through the aid of data analytics, machine learning, and artificial intelligence (AI). This leads to improved diagnostic precision and earlier detection of diseases (Ruaya, 2023; Feldman et al., 2017). Medical professionals are able to foresee patient needs and potential risks because they have the ability to compile and analyze extensive datasets with predictive tools in telemedicine (Lee et al., 2018).

Cloud-based Electronic Health Record (EHR) systems also mitigate administrative challenges. This enhances operational effectiveness and lower the chances of misplacement

of records or misfiled in addition to improving patient care. Studies by Addo and Agyepong, (2020) indicate that adopting Cloud-based Electronic Health Records has led to shorter patient wait times and fewer instances of missing medical records. This gives healthcare professionals to dedicate more time to direct patient interactions instead of enormous paperwork. Maddikunta et al., (2020), also agreed that the capability to access patient data remotely by healthcare practitioners via cloud systems do further aids them in making timely decisions. This are seen especially in critical situations like emergencies or during health crises like pandemics.

Managing data within Information and Communication Technology platform is paramount. This is essential for the smooth functioning of healthcare service delivery systems and it also optimize patient care. Data accuracy, accessibility, and security of data are enhanced with the evolution of Patient record management systems. Healthcare professionals are able to manage patient information efficiently with this system. The system mitigates the risk of critical data missing or misinterpreted which are crucial for accurate diagnoses and effective treatment plans (Cerchione et al., 2023). Furthermore, Information and Communication Technology platforms such as medical practice management software has help to streamlined both clinical and administrative processes. This leads to the reduction on time spent on routine tasks and gives healthcare staff more time to spend on patient care (Ruaya, 2023).

The impact of Information and Communication Technology on healthcare service delivery is significant because it brings many improvements in both efficiency and service quality. Information and Communication Technology is regarded as a General Purpose Technology (GPT) which can drive impactful changes and innovations across different sectors of the society including healthcare. As supported by Bresnahan and Trajtenberg (1995) General Purpose Technology (GPTs) like Information and Communication Technology have broad effects across different fields. It promotes new organizational models with better service delivery and improved productivity. Information and Communication Technology in the healthcare sector enables the digitization of medical records, patient monitoring, and decision-making tools. All these enhances patient care and reduce operational expenses to elevate overall healthcare service delivery quality. The automation of administrative functions to boosting the efficiency of healthcare institutions is as a result of widespread

integration of Information and Communication Technology. Schumpeter's (1934) theory of innovation with the healthcare industry being a prime example of the transformative effect emphasizes how technological advancements contribute to economic and social growth.

The integration of information and communication technology (ICT) into healthcare systems has substantially reshaped the management of patient data. It enhances healthcare service delivery especially in settings with limited resources. Moving to digital records in countries like Nigeria where healthcare service delivery system has typically depended on paper-based record systems has cut administrative costs. It also improved both the precision and availability of patient information (Ommaya et al., 2018; Foad et al., 2018). Electronic Medical Records (EMRs) leads to improved care coordination and helping healthcare systems respond more efficiently to crises like infectious disease outbreaks. This is possible because Electronic Medical Records has streamlined the sharing of patient data among healthcare service providers (Shaikh et al., 2015). The worldwide exchange of patient information and promoting international collaboration in medical research to enhance patient care is possible with the implementation of advanced technologies in healthcare data management. Medical surgeons minimizes the risk of errors due to tools like telemedicine and virtual surgery simulations which assist in medical training. This tools allow surgeons to refine their skills in simulated environments before conducting real surgeries. The integration of information and communication technology (ICT) into healthcare service delivery in essence has led to notable enhancements in operational efficiency and access to good healthcare services.

The promise of further improving healthcare service delivery globally is as the healthcare industry continues to integrate technological advancements. This is as the result of ongoing development of more advance electronic health records, telemedicine, and mobile health applications. These innovations has fundamentally transformed the future of healthcare and not only enabling healthcare professionals to make more informed choices. It also help to boost patient engagement for a better healthcare outcomes and streamline healthcare processes. Hospital managements and healthcare sector stakeholders must take proactive measures to maintain these positive effects. Increase in healthcare infrastructure budgets to support the expansion of information and communication technology resources will ultimately improve the overall quality of patient care across all general hospitals.

Empirical Literature Review

Chauhan and Singh (2020) pointed out that effectively narrowing geographical and logistical gaps in healthcare service delivery are solutions from Information and Communication Technology. These solutions are experience in telemedicine, mobile health apps, and Electronic Health Record systems which have broadened healthcare access in rural and underserved regions. The global progress of Information and Communication Technology and its implementation has drawn increasing attention from development partners and scholars in the past three decades. Including healthcare and in both developed and developing nations these development partners and scholars are perceptive on researching the dynamic influence of Information and Communication Technology adoption on various development outcomes. Human development index (Hartmann, 2005), economic growth (Bresnahan & Trajtenberg, 1995; Schumpeter, 1942), corruption (Verspagen, 1999), and financial inclusion (Bresnahan & Trajtenberg, 1995; Verspagen, 1999), among other factors are intriguing body of literature that discusses the effects of Information and Communication Technology on development outcomes. Yet contrasting findings which are often linked to the specific scope of studies and the econometric methods employed have surfaced.

A compelling evidence shows that information and communication technologies (ICTs) affect the demand for reproductive healthcare services during research study in Ghana by Afroz et al, (2015). The probit regression assessment observed that the coefficients interrelated with mobile phone ownership were invariably positive and statistically important. The current use of contraception, timing of the initial antenatal check-up, location of delivery, and antenatal care were all the four reproductive health services assessed. The findings suggested that compared to those living in households lacking such technologies women in households equipped with ICT facilities are likely to have an advantage in accessing maternal healthcare services. Buntin et al. (2011), outlined that the accuracy and accessibility of patient information are significantly improve with electronic health record (EHR) systems. The improvement accuracy and accessibility of patient information decreases the likelihood of medical errors and boosts patient safety overall. Streamlined data management and noting of fewer incidents of missing or misplaced records are enjoyed by facilities implementing electronic health record (EHRs) as

highlighted by the above research. Particularly in multidisciplinary healthcare service delivery environments Wang et al. (2013) emphasized electronic health records' pivotal role in enhancing care coordination. Electronic Health Records promote enhanced communication among healthcare service providers by centralizing patient information into one digital record. It reduces the risks of duplicate tests or conflicting diagnoses and treatment delays often seen in traditional paper-based healthcare systems. This is because it allows for more informed decision-making and better collaboration among healthcare workers.

Vest and Gamm (2010) especially uses emergency situations to point out the beneficial impact of Health Information Exchange (HIE) on patient care. Greatly enhanced clinical decision-making and minimized chances of adverse events are the result of having quick access to patient history including allergies and past treatments. Particularly in low-income environments several obstacles to the widespread adoption of HIE still exist today despite its enormous promises. Major challenges identified by Tan et al. (2014) includes concerns about data privacy and interoperability issues among different ICT systems. Tan et al also identified lack of standardized protocols by healthcare facilities as another major challenges. Successful implementation of HIE are based on addressing these challenges through good policy development, increased in technological investments, and adequate training of healthcare workers. Healthcare professionals having patient more accurate data, fewer errors, and increased efficiency in care delivery are as the result of introduction of Electronic Health Records. While improved communication, accelerated diagnoses and lowered healthcare costs are as the result of HIE systems. HIE contributes to cost reduction by preventing unnecessary tests and procedures and not only boosts healthcare efficiency was the conclusion of the study

Theoretical Framework

Modernization Theory

This studies firmly rely on Modernization theory. Modernization theory has been a key structure in sociology of development since the 1950s. The Modernization theory outlined illiteracy, poverty, traditions, and certain attitudes as factors that contributes to underdevelopment in countries. Addressing these internal factors are viewed as the most effective strategy for rapid development in these countries. The various pathways which

societies can achieve modernity (or development) through economic growth and a complete transformation of their social, political, and cultural frameworks are the emphasis of Modernization theory. Modernization theory suggests that societies advance through specific developmental stages. These happens when such societies embraces technological, economic, and institutional innovations which will result in a more intricate and efficient social structure Rostow (1960).

Bradshaw, (1987); Escobar, (1995); Chirot and Hall, (1982); Shrum, (2000) assert that Modernization theory views development as a gradual evolutionary process where all societies move from agricultural, rural, and traditional position to post-industrial, urban, and modern societies. Chirot and Hall (1982) further elaborated that this Modernization theory outlines a predetermined sequence of development stages which includes:

- i. Traditional economies,
- ii. a transition phase,
- iii. the take-off stage,
- iv. the drive to maturity,
- v. the age of high consumption, and finally
- vi. a post-industrial society.

Embracing innovative scientific methods, adopting scientific thinking, and acquiring techno-scientific skills are importants for transitioning to the take-off phase of development according to W.W. Rostow who was a key advocate of modernization theory (Chirot and Hall, 1982). The belief that science and technology creates an environment conducive to economic growth in developing countries are those of proponents of modernization theory. These growth are primarily through their capacity to foster rational decision-making processes for the effective utilization of material and human resources (Shrum and Shenhav, 1995). Evolving from traditional societies to modern institutions Modernization theory suggests that as countries progress they typically adopt more advanced technologies and systems. The integration of Information and Communication Technology (ICT) into healthcare framework is the primary indicator of Modernization theory to the healthcare sector.

The application of Information and Communication Technology (ICT) into hospital services illustrates how developing societies can transition from outdated, paper-based healthcare systems to more efficient and data-driven models. This application promotes effective service delivery, equality, and improved outcomes in healthcare service delivery. Information and Communication Technology (ICT) plays an important role in facilitating these transformations in several ways in contemporary healthcare settings which includes:

Healthcare Service Delivery Transition from Traditional to Modern Systems; Modernization theory suggests a gradual shift from manual and paper-based healthcare services to digital and automated systems. The move towards modernization which has enhanced workflows and increased accuracy in healthcare service delivery within hospitals uses tools such as mobile health applications and Electronic Health Records (EHRs) for real-time communication, telemedicine, and digital diagnostics. WHO (2016), observed that these tools also offer clinical support systems because they are ultimately designed to boost the speed, precision, and coordination of healthcare.

Improves Efficiency and Quality of Healthcare Service Delivery: Contemporary general hospitals with the modernization of healthcare services are utilizing Information and Communication Technology (ICT) to improve service delivery. Improves efficiency and quality of healthcare service delivery is accomplished in several ways such as:

- i. **Automated Schedule Systems:** Information and Communication Technology (ICT) systems have considerably reduced wait times in hospitals. This allows patients to book their appointments online from the comfort of their homes which eliminates the need for them to queue up at healthcare facilities.
- ii. **Real-Time Monitoring of Patient by Healthcare Professionals:** This capability by Information and Communication Technology is facilitated by wearable devices. This promotes proactive care for patients.

The principles of Modernization theory align with these advancements. This emphasizes improved efficiency in healthcare service delivery via technological innovations. Dixon (2007), noted that automating routine tasks such as appointment scheduling and prescription management reflects this approach on the integration of Information and Communication Technology in healthcare service. Wearable technologies lead to a decrease in human errors and enable real-time patient monitoring.

Global Healthcare Integration and Medical Knowledge Sharing in Healthcare Services

Delivery; The creation of interconnected global data systems is promoted by the modernization of healthcare delivery services. Information and Communication Technology (ICT) integration in healthcare service delivery gives room for:

- i. Facilitating the exchange of ideas on new medical discoveries and collective knowledge during pandemics are result of remote consultations with other medical specialists worldwide
- ii. Participants involved in medical research to have access to global medical research databases.
- iii. Knowledge sharing among healthcare professionals globally with collaborative platforms that enhance it.

A contemporary and globalized approach to healthcare delivery advancements is nurture through Information and Communication Technology (ICT). Chandrasekhar and Ghosh (2001), emphasized this notion while stating that Information and Communication Technology (ICT) platforms enhance international collaboration in healthcare. This is done by providing access to various global medical literature with facilitating remote consultations and encouraging transnational healthcare networks. Best practices and standards from advanced healthcare systems across the globe can be adopted by hospitals in many developing nations.

Healthcare Service Delivery with Data-Driven Decision Making; More hospitals or healthcare facilities are turning to big data analytics for a variety of purposes using modernization of healthcare service delivery via Information and Communication Technology (ICT). This is achieve in the following ways:

- i. Devising control measures to alleviate their impacts after foreseeing disease outbreaks.
- ii. Ensuring effective healthcare services and treatment plans by optimizing hospital resource management.

Advancement in creating a more efficient and effective healthcare system represents a significant transition towards a data-informed approach through via Information and Communication Technology.

Medical Care Accessibility and Human Inclusion: The idea that technological progress should enhance equity and inclusion is key element of Modernization theory.

Information and communication technology plays a vital role in promoting equity in healthcare by increasing access for underserved populations Kay, et al (2011). Mobile clinics, SMS-based health campaigns, and remote diagnostics are initiatives which this are achieve. Traditional barriers such as geography, literacy, and income that have historically obstructed healthcare access are dismantled by these advancements which align with modernization goals. The dismantling of these traditional barriers allows for:

- I. Quality healthcare services through telemedicine to be access by patients in rural or underserved areas.
- II. Individuals can take charge of their health even in remote locations with modern health apps on their mobile phones

The vision of progress and equity outlined in modernization theory aligns with democratization of healthcare services How societies evolve through the adoption of modern technology is clearly outlined by Modernization theory. This modernization evolution is significantly fuelled by Information and Communication Technology (ICT) in the realm of healthcare services. Numerous hospitals has been transform from conventional care centres into smart, efficient, and inclusive health systems with the implementation of Information and Communication Technology.

The general integration of Information and Communication Technology in hospital healthcare service delivery serves both as a result of modernization and a catalyst for modernization. The principles of efficiency, rationalization, and equitable access to healthcare service are the drivers of this transformation. These above insights illustrate why modernization theory offers a significant perspective for understanding the effects of Information and Communication Technology adoption. Which are seen on healthcare delivery outcomes and medical institutional growth.

Research Methodology

A combination of survey and descriptive research designs were used by this study in collecting and analysing data. Data were collected from a sample drawn from the total population of 425 staff members at all General Hospitals Ikot Ekpene Senatorial District,

Akwa Ibom State. Using the finite population formula by Godden (2004), 203 individuals were initially selected with 200 valid responses obtained. A multi-stage sampling technique was used. This involves stratified, simple random and purposive sampling to ensure precise and representative selection of respondents. More so, structured questionnaires which aligned with the research objectives, served as the primary tool for data collection. In order to ensure proper completion and retrieval, the questionnaires were personally administered and collected. The anonymity of responses was enhanced for the reliability and honesty of the data from respondents. Finally, to test hypotheses and determine relationships between variables, a quantitative analysis was conducted using the Chi-square (X^2) statistical method at a 0.05 level of significance. This allowed the researcher to draw valid conclusions which aligned with the study's objectives.

Testing of Research Hypothesis

Testing of Hypothesis I: Information and communication technology has no significant influence on healthcare service delivery in general hospitals Ikot Ekpene Senatorial District, Akwa Ibom State.

S/N	Statements	SA	A	SD	D	Total
1.	Information and Communication Technology tools such as electronic medical records, mobile health apps have improved the accuracy of patients' diagnosis and treatment in healthcare delivery	55	75	40	30	200
2.	The use of Information and Communication Technology has made it easier and faster for healthcare professionals to access and share patient's information	60	70	45	25	200
3.	Information and Communication Technology has enhanced communication between patient and healthcare providers	60	80	40	20	200
4.	Information and Communication Technology adoption has led to more timely and efficient delivery of healthcare services in my facility or communication	90	70	30	10	200
5.	Since the introduction of Information and Communication Technology in healthcare, overall patient satisfaction with service delivery has improved.	70	80	35	15	200

Source: Author Computation (2025)

Table 4.2.1: Chi-Square calculation for Hypothesis I.

SA	A	SD	D	TOTAL	χ^2 Cal.	χ^2 Tab.
1.	55	75	40	30	200	
2.	60	70	25	25	200	
3.	60	80	40	20	200	
4.	90	70	30	10	200	
5.	70	80	35	15	200	
Total	335	375	190	100	1000	
					28.15	21.026

$$\chi^2 = 28.15$$

$$D/f = (R-1) (C-1)$$

$$= (4-1) (5-1)$$

$$\chi^2 = 3 \times 4 = 12$$

$$T_v = 21.026$$

Decision

The chi-square test ($\chi^2 = 28.15$, $p < 0.05$) confirmed that information and communication technology have a significance impact on healthcare delivery in general Hospitals in Ikot Ekpene Senatorial District. Over the past years under studies, there has been a consistent observation within general hospitals in Ikot Ekpene senatorial district that healthcare service quality has improved due to introduction of Information and Communication Technology into operation. These result echo Ventola (2014) that information and communication technology improves data accuracy, strengthens health information management, and enables better monitoring of patient outcome. More so, Wang et al

(2018) asserted that Information and Communication Technology facilitates real-time information exchange between healthcare providers, supports clinical decision-making, and promote continuity of care, particularly in remote and underserved regions. Altogether, the evidence points to the fact that the proper utilization of Information and Communication Technology in healthcare likely contributes to the positive healthcare services and also positively impact the quality of patients' care provided.

Testing of Hypothesis II: Patients' data management via Information and Communication Technology has no significant influence on healthcare service delivery in general hospitals in Ikot Ekpene Senatorial District Akwa Ibom State.

S/N	Statements	SA	A	SD	D	Total
6	Using Information and Communication Technology system for managing patient record has improved the accuracy and reliability of healthcare delivery	56	74	42	28	200
7	Electronic data management has made it easier for healthcare professionals to coordinate patient care across departments or facilities.	62	68	47	23	200
8	Access to digital patient's data allows faster decision-making in diagnosis and treatment.	62	78	43	17	200
9	Managing patient data via Information and Communication Technology has reduce medical errors and improved patient safety.	92	68	28	12	200
10	The use of Information and Communication Technology in storing and retrieving patients' data enhances the efficiency of healthcare service delivery.	69	81	33	17	200

Source: Author Computation (2025)

Table 4.2.2: Chi-Square Calculation for Hypothesis II

	SA	A	SD	D	TOTAL	χ^2 Cal.	χ^2 Tab.
1.	56	74	42	28	200		
2.	62	68	47	23	200		
3.	62	78	43	17	200		
4.	92	68	28	12	200		
5.	69	81	33	17	200		
Total	341	369	193	97	1000	27.97	21.026

$$\chi^2 = 27.97$$

$$D/f = (R-1) (C-1)$$

$$= (4-1) (5-1)$$

$$\chi^2 = 3 \times 4 = 12$$

$$T_v = 21.026$$

Decision

The Chi-square analysis ($\chi^2 = 27.97$, $p < 0.05$) clearly suggest that suggest that patients' data management via Information and Communication Technology has a significant influence on healthcare service delivery in general Hospitals in Ikot Ekepne Senatorial District. When patients' data are managed with Information and Communication Technology it increases the overall productivity of the hospitals. This finding underscore the importance of integrating Information and Communication Technology into patients' data management within hospitals. These results, consistent with Ghosh et al. (2022), underscore the critical need that information and communication technology-enabled data systems enhance operation efficiency, enable remote monitoring and support public health surveillance and research – critical components for both routine care emergency response.

Discussion of Findings

All empirical evidence gathered from all General Hospitals Ikot Ekpene Senatorial District emphasis the essential role of information and communication technology and patients' data management via ICT on healthcare delivery. First, the significant association between Information and communication technology and healthcare delivery ($\chi^2 = 28.15$, $p < 0.05$) highlights Information and communication technology in healthcare services. In a general hospitals which are high-pressure environment failure to integrate ICT services into operation can undermine the quality of patient care. These results mirror Ventola (2014) assertion that information and communication technology improves data accuracy, strengthens health information management, and enables better monitoring of patient outcome.

Wang et al (2018) also agreed that Information and Communication Technology facilitates real-time information exchange between healthcare providers, supports clinical decision-making, and promote continuity of care, particularly in remote and underserved regions.

Secondly, the analysis of Patients' data management via Information and Communication Technology ($\chi^2 = 27.97$, $p < 0.05$) confirms that patients' data management via ICT has a significant influence on healthcare service delivery. Consistent with Ghosh et al. (2022) this finding illustrates that meaningful information and communication technology-enabled data systems enhance operation efficiency, enable remote monitoring and support public health surveillance and research – critical components for both routine care emergency response. In the context of proper implementation of data management via ICT into healthcare services it does not only positively impacts healthcare productivity but also enhances broader service delivery and patient outcomes. Collectively, these findings paint a clear picture: the prevailing organizational climate at General Hospitals in Ikot Ekpene Senatorial District characterised by use of information and communication technology and management of patients' data via ICT creates a more vibrant healthcare delivery system. In line with extant modernization literature, the impact of Information and Communication Technology on healthcare delivery has help to up-leapt the healthcare services.

Conclusion

Healthcare service delivery at all General Hospitals in Ikot Ekpene Senatorial District Akwa Ibom State depends on three interrelated modernization: Information and Communication Technology, data management via ICT and health information exchange via ICT. When information and communication technology is not fully integrated into healthcare services it leads to arduous tasks to healthcare workers especially in high stress environments like general hospitals. Likewise, proper integration of Information and Communication technology in healthcare services increases both staff productivity and reduces stress directly affecting patient care quality. If best Information and communication technology and well trained staff are provided in hospitals it will result in high quality healthcare services delivery. This will trigger easy access to patients' diagnosis and access to their files which will results increase overall hospitals service standards. The study confirms that there are positive impact of Information and Communication technology, patients' data management via ICT and health information exchange via ICT

strengthen general hospitals' high quality care capacity. To continue this trend, the following recommendations are proposed.

Recommendations

- i. All General Hospitals in Ikot Ekpene Senatorial District Akwa Ibom State should continue to modernize their facilities with current and standard Information and Communication Technological gadgets. Staff of these hospitals should also be train on how to apply these gadget to enhance quality healthcare service delivery.
- ii. Hospital managements should make sure patients' data are management with Information and communication technology. Awareness should be created for both healthcare workers and non-healthcare workers in all General Hospitals in Ikot Ekpene Senatorial District on the positive impact of patients' data management via Information and Communication technology.
- iii. High speed internet broadband should be provided for each general hospital environment to guard against fluctuating network while health information are being exchanged between hospitals.

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