Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 1s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Pharmacy informatics and health information technology a systematic review

Rashmi Pandey[1], Himanshu Nirmal Chandu[2]

[1]Assistant Professor, Department of Pharmacy, Kalinga University, Raipur, India.

[2]Research Scholar, Department of Pharmacy, Kalinga University, Raipur, India.

Cite this paper as: Rashmi Pandey, Himanshu Nirmal Chandu, (2025) Pharmacy informatics and health information technology a systematic review *Journal of Neonatal Surgery*, 14 (1s), 554 -560 .

ABSTRACT

In many developing nations, e-government has become a focal point of governance initiatives. e-Government is thought to be a way to cut expenses, enhance services, save time, boost efficacy, and improve efficiency. The first significant move towards e-governance was the creation of the National Informatics Centre (NIC) in 1977 after the Government of India established the Authority of Electronics in 1970. Information and communication technology has made its way into Indian administration and is already demonstrating its efficacy. In the fields of management and administration, e-governance adaption meets numerous obstacles and difficulties. This study focuses on investigating the elements that influence e-governance's success or failure in relation to the Food and Drugs Control Administration's (FDCA) ten years of e-governance implementation. To expand the uses of eGovernment, it has investigated the potential of geospatial technology and created a spatial decision support system. The Gujarati FDCA's e-governance system is called "eXtended Licensing, Laboratory & Legal Node (XLN)." Since 2007, it has been in operation.

Keywords: *E-Governance, NIC, FDCA, XLN, Community level.*

1 INTRODUCTION

Inherently, governmental public health is a network of federal, state, and local organizations that work together to prevent, respond to, and control disease in the United States. Over time, various agencies' functions and responsibilities within the government have changed. These organizations were founded some decades ago to offer fundamental community services, such as gathering vital statistics, promoting healthy lifestyles and health education, and providing prevention services (such wellchild care). These services also included sanitation, illness prevention and control, and the guarantee of safe drinking water. Traditional public health practice focuses on the population and operates at the community level. To address particular community health requirements, which may vary from jurisdiction to jurisdiction, the approach must be adaptable. With the aid of technology, the globe has advanced rapidly in recent years. Developing nations place a strong emphasis on using technology to stay up to date with contemporary advancements [1].

Human health is being jeopardized as a result of technological advancement, adaption, and competition. A nation's economy may thrive when its citizens are in good health. The primary health condition of the human race must be addressed by Urban Local Bodies. Since health is a state subject, two distinct state-level authorities are in charge of regulating matters pertaining to public health. They are the Food and Drugs Control Administration (FDCA) and the Ministry of Health and Family Welfare. Programs including Communicable Diseases, Non-Communicable Diseases, Injury & Trauma, and Poor Patients-Financial Assistance are overseen by the Ministry of Health and Family Welfare. These programs address the general welfare and health of the populace. The Food and Drugs Control Administration, on the other hand, oversees and controls the nation's food and drug regulatory systems to guarantee the supply of safe, high-quality medications and nutritious food [2]. The FDCA is in charge of enforcing laws and keeping an eye on the cost and quality of medications from the moment of manufacture until they are purchased by the average person.

With the aid of technology, the globe has advanced rapidly in recent years. Developing nations place a strong emphasis on using technology to stay up to date with contemporary advancements. Human health is being jeopardized as a result of technological advancement, adaption, and competition. A nation's economy may thrive

when its citizens are in good health. The primary health condition of the human race must be addressed by Urban Local Bodies. Since health is a state subject, two distinct state-level authorities are in charge of regulating matters pertaining to public health [3]. They are the Food and Drugs Control Administration (FDCA) and the Ministry of Health and Family Welfare. Programs including Communicable Diseases, Non-Communicable Diseases, Injury & Trauma, and Poor Patients-Financial Assistance are overseen by the Ministry of Health and Family Welfare. These programs address the general welfare and health of the populace. The Food and Drugs Control Administration, on the other hand, oversees and controls the nation's food and drug regulatory systems to guarantee the supply of safe, high-quality medications and nutritious food. The FDCA is in charge of enforcing laws and keeping an eye on the cost and quality of medications from the moment of manufacture until they are purchased by the average person [4].

2 LITERATURE REVIEW

The literature from various studies conducted in the same field of study is reviewed in this section of the thesis. One of the most crucial components of every research project is the literature review, which offers insights into the study and then goes on to discuss its implications. The methodologies taken in previous studies on the subject are revealed by a survey of the literature, and these can serve as a guide for choosing the methods to be employed. It also aids in comprehending the challenges experienced by earlier researchers who used previously unexplored research methodologies [5]. In many nations around the world, e-governance implementation has emerged as a top priority with the aim of streamlining operations, cutting expenses, and enhancing governance's efficacy and capacity. Users' perceptions of healthcare technology adoption and use have been investigated in a number of research. As anticipated, the majority of the research focuses on the perspectives of medical practitioners. Remarkably, there have been reports of both positive and bad attitudes and experiences. Darbyshire (2004) and Moody et al. (2004) investigated nurses' preferences and attitudes toward EHRs. In their study, Moody et al. (2004) used a questionnaire survey using a quantitative research approach. The findings demonstrated that a sizable portion of the nursing staff had a favorable opinion of how EHRs affected patient care [6]. 75% of respondents believed that EHRs had improved documentation, and 81% said that using them was more beneficial than detrimental to care. Sixty-four percent said they did not think the EHR system has reduced the burden for nurses. Generally speaking, nurses believed that the EHR system will eventually improve patient car. Healthcare information systems and the experiences of healthcare professionals have been the subject of numerous research on ICT use and related experiences. Generally speaking, one of the primary issues with adapting healthcare information systems has been "ease of use." The practices of healthcare professionals and the information technologies now in use are incompatible, according to a number of findings. Van der Meijden et al. (2003) discovered papers that detailed users' grievances on the challenging procedures for electronically entering medical data throughout their systematic literature review analysis. Moreover, other studies proposed that the difficulty was caused by excessive work and systemic issues like rigidity [7].

Objective

- To examine the elements influencing tertiary care hospital patients' satisfaction with pharmacy services.
- To determine research gaps between the existing state of affairs and potential solutions.
- To evaluate the future course of customer satisfaction research.
- To create a research proposal and analyze it using the ABCD method.
- To suggest future lines of inquiry about pharmacy services and client satisfaction.

3 METHODOLOGY

A collection of procedures for gathering and analyzing data is known as the research methodology (Williman, 2000). The methods and strategies employed in the research are the subject of methodology. It describes the research methodology, data gathering techniques, materials, subjects interviewed, theories, data analysis method, software development platform, and techniques. The techniques and research methodologies utilized to collect and analyze the data for this study are covered [8].

Research Design and Method

The general strategy for relating the relevant (and attainable) empirical research to the conceptual research concerns is known as the research design. Both the objective of the inquiry and the research design employed can be used to categorize it. Explanatory, descriptive, and exploratory are the three categories that are most frequently used. One research study with many goals can employ multiple strategies (Shajahan, 2009). Deductive research starts with a survey of the body of existing literature, followed by the development of a conceptual framework, the formulation of hypotheses, and data analysis to test the hypotheses. In contrast, an inductive technique allows the data to reveal the researcher's understanding of the research issue and possible hypotheses. To put it another way, the researcher enters the investigation with no prior ideas or theories [9].

Selection and Justification of the Research Design and Method

This study employs a deductive methodology. The purpose of this study is to investigate, comprehend, and pinpoint the elements that influence the FDCA, Gujarat's e-governance implementation's success or failure. It also entails determining the e-governance deficiencies and creating a geospatial solution prototype to fill them. It makes an effort to investigate how officers' effectiveness in monitoring and managing pharmaceutical medications is affected by technology advancements. Exploratory research is carried out to fully comprehend the FDCA's current operational procedure in order to accomplish this. Analytical studies are another name for explanatory research.

This part concentrated on providing a thorough explanation of the study's methodology. The study plan, method, and study population were all provided in the chapter. It also demonstrated how the technique selected for the dissertation was consistent and valid, as well as how data was gathered, examined, and discussed. Research design, demographic, sample selection, tools to be employed, data processing, and analysis are all specifically covered. In order to conduct a thorough investigation of personality, grouping, institution, or phenomenon, the study was conducted using a cross-sectional design, which is a type of research that involves various groups of people with varying levels of awareness but who share characteristics such as civilization and financial status, educational background, and ethnicity.

4 ANALYSES AND RESULT

The analytical instruments and techniques employed to accomplish the goal of assessing the efficacy and influence of e-governance on the FDCA and the stakeholders are described in this section. The SWOT analysis, factor model, design reality gap model, and geographic technology are the instruments. An effort has been made to conduct a thorough study of the information gathered from the FDCA. The purpose of this study was to determine the best methods for health information management in order to provide efficient medical care in a few chosen tertiary hospitals located in the Nigerian states of Jigawa and Kano. Descriptive statistics (frequency, percentage, and charts) were utilized to examine the respondent demographics and research questions, while inferential statistics (chi square and correlation) were employed to test hypotheses 1-4. Hypotheses 1-3 were examined using chi square, and hypothesis 4 was assessed using correlation. In accordance with this, 1000 copies of the questionnaire were given to the patients; nevertheless, 995 copies were retrieved, representing a 99.6% return rate.

Table 1: Demographic details of study subjects

Parameter	Test (%) (n = 2025)	Control (%) (n = 2040)	Total (%) (n = 4065)	P value
Males	1140 (56.2)	1146 (56)	2286 (56.2)	0.889
Females	885 (43.7)	894 (44)	1779 (43.8)	
Age				0.022
<18	1(0.05)	1 (0.05)	2 (0.05)	
18-29	45 (2.2)	66 (3.23)	111 (2.7)	
30-49	779 (38.4)	723 (35.4)	1502 (36.9)	
50-59	814 (40.1)	825 (40.4)	1639 (40.3)	
60-79	216 (10.6)	265 (12.9)	481 (11.8)	
≥ 80	170 (8.39)	160 (7.8)	330 (8.1)	
Average Age	51.56 ± 15.87 (range – 17-90)	49.32 ± 16.46 (range – 16-91)	53.52 ± 15.54 (range – 16-91)	0.11
Education	427 (21)	580 (28.4)	1007 (25)	< 0.001
Illiterate Upto 5 Grade	519 (25.6)	480 (23.5)	999 (24.5)	
6-10 Grade PreUniversity Graduate and above	554 (27.3)	686 (33.6)	1240 (30.5)	
	475 (23.4)	274 (13.4)	749 (18.4)	
	50 (2.4)	20 (0.9)	70 (1.7)	
Average number of medications prescribed	8.10 ± 3.67 (range – 3-17)	6.60 ± 2.83 (range – 2-17)	7.34 ± 3.35 (range – 2-17)	0.024
CKD Stages	280 (13.8)	298 (14.6)	578 (14.2)	

Stage 1 Stage 2 Stage 3 Stage 4 Stage 5	311(15.3) 530 (26.1) 590 (29.1) 314 (15.5)	330 (16.1) 499 (24.4) 583 (28.5) 330 (16.1)	641 (15.7) 1029 (25.3) 1173 (28.8) 644 (15.8)	0.647
No of Co- morbidities 0 1 2 3 4 >4	180 (8.8) 215 (10.6) 485 (23.9) 561 (27.7) 510 (25.1) 74 (3.65)	170 (8.3) 227 (11.1) 478 (23.4) 578 (28.3) 501 (24.5) 86 (4.2)	350 (8.6) 442 (10.9) 963 (23.7) 1139 (28) 1011 (24.9) 160 (3.9)	0.758
Kuppuswamy SES Upper (> 25) Upper Middle (16- 25) Lower Middle (11- 15) Upper-lower (5-10) Lower (<5)	 18 (0.8) 34 (1.6) 985 (48.6) 945 (46.6) 48 (2.4)	 22 (1) 14 (0.7) 1014 (49.7) 913 (44.7) 77 (3.8)	 40 (1) 48 (1.1) 1994 (49) 1858 (45) 125 (3.9)	0.001

In many developing nations, e-Government is now the main focus of governance initiatives. e-Government is thought to be a way to cut expenses, enhance services, save time, boost efficacy, and improve efficiency. The first significant move towards e-governance was the creation of the National Informatics Centre (NIC) in 1977 after the Government of India established the Authority of Electronics in 1970. Information and communication technology has made its way into Indian administration and is already demonstrating its efficacy. In the fields of management and administration, e-governance adaption meets numerous obstacles and difficulties. This study focuses on investigating the elements that influence e-governance's success or failure in relation to the Food and Drugs Control Administration's (FDCA) ten years of e-governance implementation. To expand the uses of egovernance, it has investigated the potential of geospatial technology and created a spatial decision support system.

Table 2: Demographic details of admitted study subjects

Parameter	**Test (n = 1991)**	**Control (n = 2006)**	**Total (%) (n = 3997)**
Males	1115 (56)	1119 (55.8)	2234 (55.9)
Females	876 (44)	887 (44.2)	1763 (44.1)
Age <18 18-29 30-49 50-59 60-79 ≥ 80	1 (0.05) 39 (1.96) 767 (38.52) 509 (25.57) 505 (25.36) 170 (8.54)	1 (0.05) 61 (3.04) 710 (35.39) 517 (25.77) 557 (27.77) 160 (7.98)	2 (0.05) 100 (2.5) 1477 (36.9) 1026 (25.6) 1062 (26.7) 330 (8.3)
Average Age	53.64 ± 16.48 (range – 17-90)	50.04 ± 16.90 (range – 16-91)	52.03 ± 16.44 (range – 16-91)
Education			

Illiterate Upto 5 Grade 6-10 Grade Pre University Graduate and above	425 (21.35) 510 (25.62) 550 (27.62) 460 (23.1) 46 (2.31)	576 (28.71) 470 (23.43) 680 (33.9) 260 (12.96) 20 (1.0)	1001 (25) 980 (24.5) 1230 (30.8) 720 (18) 66 (1.7)
Average number of medications prescribed	8.35 ± 3.91 (range – 3-17)	7.33 ± 8.92 (range – 2-17)	7.83 ± 6.92 (range – 2-17)
Average length of stay in hospital (days)	6.19 ± 5.31 (range – 3-27)	6.74 ± 1.74 (range – 3-31)	6.37 ± 2.97 (range – 3-31)
CKD Stages Stage 1 Stage 2 Stage 3 Stage 4 Stage 5	 280 (14.06) 311 (15.62) 530 (26.62) 590 (29.63) 280 (14.06)	 298 (14.86) 330 (16.45) 499 (24.88) 583 (29.06) 296 (14.76)	 578 (14.5) 641 (16) 1029 (25.7) 1173 (29.4) 576 (14.4)
No of Co-morbidities 0 1 2 3 4 >4	 180 (9.04) 210 (10.55) 480 (24.11) 550 (27.62) 501(25.16) 70 (3.52)	 170 (8.47) 222 (11.07) 470 (23.43) 570 (28.41) 489 (24.38) 85 (4.24)	 350 (8.8) 432 (10.8) 950 (23.8) 1120 (28) 990 (24.8) 155 (3.8)
Kuppuswamy SES Upper (> 25) Upper Middle (16-25) Lower Middle (11-15) Upper-lower (5-10) Lower (<5)	 18 (0.90) 32 (1.61) 971 (48.77) 935 (46.96) 35 (1.76)	 22 (1.10) 12 (0.60) 1005 (50.10) 904 (45.06) 63 (3.14)	 40 (1) 44 (1.1) 1976 (50) 1839 (46) 98 (2.4)

The development of our country greatly depends on the health of its citizens. People should have timely access to high-quality medications, and the FDCA is making every effort to efficiently monitor and manage the resources at its disposal. Information about possible regions that require medical assistance can be obtained using geospatial results.

Table 3: pharmacist interventions

Intervention Code	**Intervention**	**Number (%)**		
		Test (n=814)	**Control (n=471)**	**Total (n=1285)***
I1. At prescriber level				
I1.2	Prescriber asked for information	25 (3.07)	11 (2.34)	**36 (2.8)**
I1.3	Intervention proposed, approved by prescriber	767 (94.23)	442 (93.84)	**1209 (94)**
I1.4	Intervention proposed, not approved by prescriber	22 (2.70)	18 (3.82)	**40 (3.2)**

I2. At patient/carer level				
I2.1	Patient (medication) counseling	38 (4.67)	27 (5.73)	65 (5)
I3 At drug level				
I3.1	Drug Changed	58 (7.13)	30 (6.37)	88 (6.8)
I3.2	Dose Changed	102 (12.53)	95 (20.17)	197 (15.3)
I3.3	Formulation Changed to	23 (2.83)	20 (4.25)	43 (3.3)
I3.5	Drug Stopped	251 (30.84)	74 (15.71)	325 (25.2)
I3.6	New Drug Started	192 (23.59)	73 (15.50)	265 (20.6)
I4 Other intervention or activity - Specify				
I4.1	Frequency Changed	66 (8.11)	54 (11.46)	120 (9.3)
I4.1	Laboratory Monitoring Requested	65 (7.99)	69 (14.65)	134 (10.4)
I4.1	Improved documentation	19 (2.33)	29 (6.16)	48 (3.7)

There are numerous hospitals and pharmacies in the urban area surrounding the cities of Bharuch and Ankleshwar. More than 5,000 people live in an area with well-equipped medical facilities. There are no medical facilities in villages with fewer residents. The results of weighted overlay analysis have been categorized as not appropriate, suitable, and most suitable. The majority of the areas are seen to be the most appropriate because they are remote from the current medical services. Areas with medical services in neighboring cities or villages are also deemed appropriate. Areas that already have access to medical facilities are deemed unsuitable or least suitable.

5 CONCLUSION

It is noted that the Central Government and State Governments have well defined roles. While the State Government handles licensing production and sales units within the state, the Central Government handles all important licenses that fall within the central level. The State Government makes sure that the Acts and Rules are applied and adhered to in the state, while the Central Government investigates amendments to the Acts and Rules. By conducting thorough monitoring and inspections, the Central and State Governments both take significant steps to preserve the quality of pharmaceuticals and stop counterfeit medications from being sold. Therefore, it can be claimed that the Central and State Governments' tasks are clearly divided, making it much simpler and more effective to execute sensible drug monitoring regulations in India. In order to monitor and manage governance with an awareness of the Acts, Rules, and Law and Order for pharmaceutical products, the duties of various officers in the FDCA were examined.

REFERENCES

[1] Chalmers J, Siska M, Le T, Knoer S. Pharmacy informatics in multihospital health systems: opportunities and challenges. The Bulletin of the American Society of Hospital Pharmacists. 2018 Apr 1;75(7):457-64. https://doi.org/10.2146/ajhp170580

[2] Fischer SH, Tjia J, Field TS. Impact of health information technology interventions to improve medication laboratory monitoring for ambulatory patients: a systematic review. Journal of the American Medical Informatics Association. 2010 Nov 1;17(6):631-6. https://doi.org/10.1136/jamia.2009.000794

[3] Rahimi B, Nadri H, Afshar HL, Timpka T. A systematic review of the technology acceptance model in health informatics. Applied clinical informatics. 2018 Jul;9(03):604-34. https://doi.org/10.1055/s-0038-1668091

[4] Jones SS, Rudin RS, Perry T, Shekelle PG. Health information technology: an updated systematic review with a focus on meaningful use. Annals of internal medicine. 2014 Jan 7;160(1):48-54.

[5] White CL, Hohmeier KC. Pharmacy informatics: current and future roles for the pharmacy technician. Journal of Pharmacy Technology. 2015 Dec;31(6):247-52. https://doi.org/10.1177/8755122515605517

[6] Ait Gacem S, Huri HZ, Wahab IA, Abduelkarem AR. Investigating digital determinants shaping pharmacists' preparedness for interoperability and health informatics practice evolution: a systematic review. International Journal of Clinical Pharmacy. 2025 Jan 4:1-1. https://doi.org/10.1007/s11096-024-01851-6

[7] Cortes D, Leung J, Ryl A, Lieu J. Pharmacy informatics: Where medication use and technology meet. The Canadian Journal of Hospital Pharmacy. 2018 Aug 31;72(4):320.

[8] Hincapie AL, Cutler TW, Fingado AR. Incorporating health information technology and pharmacy informatics in a pharmacy professional didactic curriculum-with a team-based learning approach. American journal of pharmaceutical education. 2016 Aug 25;80(6):107. https://doi.org/10.5688/ajpe806107

[9] Arowili AL, Almuteri AM, Alhazmi MH, Albalawi MM, Alharbi AS, Alruwaili AB, Alshammari MS, Alruwaili AN. THE USE OF HEALTH INFORMATICS IN NURSING AND PHARMACY: IMPROVING MEDICATION MANAGEMENT AND PATIENT SAFETY. Gland Surgery. 2024 Dec 31;9(2):567-77.

[10] Brenner SK, Kaushal R, Grinspan Z, Joyce C, Kim I, Allard RJ, Delgado D, Abramson EL. Effects of health information technology on patient outcomes: a systematic review. Journal of the American Medical Informatics Association. 2016 Sep 1;23(5):1016-36. https://doi.org/10.1093/jamia/ocv138

[11] Khyade VB, Wanve HV. Statistics as efficient tool of analysis in the biomedical research. Int Acad J Sci Eng. 2018;5(1):73-84.

[12] Samyadevi V, Anguraj S, Singaravel G, Suganya S. Image based authentication using zero-knowledge protocol. Int Acad J Innov Res. 2024;11(1):1-5. https://doi.org/10.9756/IAJIR/V11I1/IAJIR1101

[13] Veerappan S. The role of digital ecosystems in digital transformation: A study of how firms collaborate and compete. Glob Perspect Manag. 2023;1(1):78-89.

[14] Devi R, Priya L. The Mechanism of Drug–Drug Interactions: A Systematic Review. Clinical Journal for Medicine, Health and Pharmacy. 2024 Sep 30;2(3):32-41.

[15] Shichkina YA, Kataeva GV, Irishina YA, Stanevich ES. The use of mobile phones to monitor the status of patients with Parkinson's disease. J. Wirel. Mob. Networks Ubiquitous Comput. Dependable Appl.. 2020 Jun;11(2):55-73.

[16] Kaur K. Health insurance: An emerging trend in India. Int Acad J Bus Manag. 2019;6(1):76-85. https://doi.org/10.9756/IAJBM/V6I1/1910010