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RESETA! READY, SET, TAG! An Integration of an Adverse Drug Reaction Reporting System using Near Field Communication Tags in a Tertiary Hospital of Davao City

Bernaldez, Deneb M.[1]; Camposano, Crissah Amor T.[2]; Cayunda, Russell V.[3]; Dabalos, Ma. Theresa S.[4]; Erlei Mandy O.[5]; Pantillo, Bea M.[6]; Tambis, Lea Kate M.[7]; Wingching, Kristine Janfer D.[8]; Dr. Faller, Erwin M.[9]

Pharmacy Department, School of Allied Health Sciences, San Pedro College, Davao City, Davao del Sur, 8000

A B S T R A C T

Deaths related to Adverse Drug Reactions mainly result from a decline in ADR reporting due to many reasons such as ignorance, diffidence, indifference, complacency, lack of monetary allowance, lack of good attitude towards ADRs reporting, inadequate understanding of ADR reporting procedures and limited access to reporting forms. [2,3,6,31]. The study will explore the use of Near-Field Communication (NFC) technology in a tertiary hospital of Davao City, involving healthcare workers in reporting which aims to resolve the underreporting of Adverse Drug Reactions both at a local and national level. Deaths related to Adverse Drug Reactions mainly result from a decline in ADR reporting due to many reasons such as ignorance, diffidence, indifference, complacency, lack of monetary allowance, lack of good attitude towards ADRs reporting, inadequate understanding of ADR reporting procedures and limited access to reporting forms. [2,3,6,31]. The study will explore the use of Near-Field Communication (NFC) technology in a tertiary hospital of Davao City, involving healthcare workers in reporting which aims to resolve the underreporting of Adverse Drug Reactions both at a local and national level. he study uses a quasi-experimental post intervention approach to determine the effectiveness of Near Field Communication Tags in increasing the prevalence of ADR reporting in a Tertiary Hospital of Davao City. Through snowball sampling, the researchers selected 48 healthcare workers (8 pharmacists, 16 physicians, 24 nurses) and divided them into the intervention group which consists of Near Field Communication tags, and the control group which uses the established pen and paper reporting forms. After 1 month, we then conducted a survey questionnaire to assess their knowledge, awareness, and effectiveness of their assigned intervention. Results showed that the intervention group reported higher levels of perceived usefulness (mean=4.56), ease of use (mean=4.76, p=0.030), and satisfaction (mean=4.66, p=0.013) compared to the control group, with overall effectiveness being significantly greater (mean=4.66, p=0.016) . Cohen's D values indicated medium effect sizes across all dimensions, demonstrating that the NFC system moderately enhanced participants' perceptions and could potentially increase ADR reporting frequencies by simplifying the process. The NFC tag-based reporting system did not significantly improve the prevalence, knowledge, and awareness of reporting ADRs. However, the users acknowledged its potential for enhanced reporting due to ease of use and satisfaction, addressing barriers like time constraints and procedural complexities. These findings support wider NFC implementation in hospitals to boost patient safety and regulatory efficiency. Future research should explore broader applications and long-term impacts of NFC technology in healthcare.

Keywords: Adverse Drug Reactions, Analysis of Variance, Near Field Communication Tags, Pharmacovigilance, Prevalence, Tertiary Hospitals

1. INTRODUCTION

Adverse Drug Reactions have claimed the lives of 2,341 people out of the 2,313,902,748 people evaluated have died from 1999-2006 in the United States based on a study by Sheperd [1]. These deaths mainly result from a decline in ADRs reporting in patients and consumers due to many reasons such as ignorance in ADRs reporting, diffidence, indifference, complacency, lack of monetary allowance, lack of good attitude towards ADRs reporting by healthcare professionals, inadequate understanding of ADR reporting procedures and limited access to reporting forms; as well as chronic medication use and drug-drug interactions. [2,3,6,31]. The study's respondents concurred that underreporting of adverse drug reactions was attributed to various factors, including complacency and insufficient training of healthcare workers, fear of litigation, healthcare worker lethargy, and the perceived insignificance of the reported ADRs [6,7]. Additionally, various unwanted side effects such as adverse drug reactions were noted as an issue by the FDA who presented findings suggesting the unsolicited use of drugs such as selling substandard and fake medicines in Metro Manila [55].

The problem of underreporting due to lack of proper attitude is also evident in Carandang's research with 140 respondents covering various healthcare workers. Of the 140 respondents, 74 (53%) encountered potential Adverse Drug Reactions in their entire duration of practice, 45 (32%) have reported a potential ADR, while 40 (29%) respondents that encountered potential ADRs within the last 6 months, only 20 (14%) have reported a potential ADR [17].

Furthermore, lack of awareness and knowledge is also a major problem in a research by Lirasan [53], the Pharmacovigilance Head of the Food and Drug Administration, who showed that of the 4347 responses, 78.6% have not reported a suspected adverse drug reaction associated with a medication while knowing that 68.6% of the respondents knew how to report them. In addition to this, a total of 88.29% of the respondents in Dizon's research on knowledge and attitude towards ADR reporting showed no experience on ADR reporting due to poor knowledge with a data of 77.60% of the respondents [54]. Additionally, there is little to no research studies conducted in the local setting pertaining to Adverse Drug Reaction Reporting.

Therefore, to enable the level up ADR reporting attitudes by increasing knowledge and awareness amongst healthcare workers the study will use Near-Field Communication (NFC) tags in a tertiary hospital which is connected to the FDA Pharmacovigilance online forms. This strategy has been proven to be effective in a study by Leskur suggesting multiple strategies for enhancing adverse drug reactions (ADRs) reporting, including improved healthcare professional education, online reporting mechanisms, involvement of pharmacists and nurses, and direct patient reporting [4]. Their suggestions also prompted the development and increased utilization of electronic reporting tools through digital technology advancements [3]. The study will explore the use of Near-Field Communication (NFC) technology in a tertiary hospital of Davao City, involving healthcare workers in reporting which aims to resolve the underreporting of Adverse Drug Reactions both at a local and national level.

2. METHOD

2.1 Research Design

A Quasi-Experimental (Post-Intervention) is an ideal research design for this study. Generally, quasi-experimental methodologies aid in the identification of the impact of an applied program, event, treatment, or an intervention by comparing the treated or interventional units to the control units - hence, estimating the significant influence or impact of such integration [45]. Moreover, in a post-intervention type of quasi-experimental research design, an intervention is implemented for one variable (interventional group) and will then be compared to the second variable (control group), allowing the researchers to collect the numerical data necessary for a study that uses a control group having no pretest [46].

The study hinges on implementing an innovative ADRs reporting system with healthcare workers in a tertiary hospital of Davao City using the integration of NFC tags. In line with that, it utilizes an intervention, where the results are not affected by the outturns of pre-testing as this design eliminates the need for distributing pre-questionnaires to assess historical ADRs reporting practices. Instead, it directly evaluates the impact of the NFC tag-based reporting system through a post-intervention analysis between the interventional and control groups.

In this design, the RESETA innovation will be implemented for a set period of one (1) month. This time frame allows for sufficient exposure to the NFC tag-based reporting system while remaining practical for the study participants. Quasi-experimental studies are known for their flexibility and can be conducted within shorter durations, typically spanning 1-3 months [63]. This approach is supported by literature such as Campbell and Stanley (1963), which highlights the adaptable nature of quasi-experimental designs, enabling researchers to efficiently assess interventions' impacts or narrow research questions within compressed time frames. While longer studies may offer deeper insights, shorter-duration quasi-experimental research remains valuable, particularly in resource-constrained settings [60].

Ultimately, as the researchers evaluate and develop the ADRs reporting system, a Quasi-Experimental Post-Intervention study, as deemed suitable for the research issue, can serve as a highly efficient and expeditious study design as it provides a comprehensive view of a population at a specific point in time, thus serving as the practical choice for assessing the research objectives without the need for succeeding assessments over time [47].

2.2 Sample Size

In quasi-experimental designs, exclusive reliance on Null Hypothesis Significance Testing (NHST) for sample size determination reveals its gaps. NHST primarily focuses on the rejection of the null hypothesis, offering no direct insight into the size of the effect [59]. This constraint is particularly acute in studies where the practical significance of the intervention's outcomes is a critical consideration.

To mitigate this limitation, quasi-experimental research often employs power analysis, which is predicated on the estimation of effect size. This approach allows for the quantification of the anticipated difference in outcomes or the relative effectiveness of an intervention across groups, such as between control and intervention groups [59]. In a similar study by Carandang et al. [17], the total sample size was 140, divided in a ratio of 1:2:3 among Pharmacists (RPhs), Physicians (MDs), and Nurses (RNs), respectively, which mimicked the actual distribution of health practitioners in the Philippines. In line with that, this study, as shown in the Table 1 below, will source participants from a tertiary hospital, with a minimum of 48 participants composed of both the intervention and control groups. The hospital will have an equal total number of participants in the intervention and control groups, adapting the 1:2:3 ratio of Pharmacists (RPhs), Physicians (MDs), and Nurses (RNs), thereby consisting of 4, 8, and 12 participants, respectively, in each of the intervention and control groups.

2.3 Sampling Method

Table 1 - Selection of Study Participants

<table>
<tr><td>1) Strata of Potential Participants</td><td colspan="3">Healthcare Professional within the Selected Tertiary Hospital Departments

1. Physicians
2. Nurses
3. Pharmacists</td></tr>
<tr><td colspan="4">2) Total Number of Participants to be Randomly Assigned</td></tr>
<tr><td rowspan="4">Total Number of Total Participants

N = 48</td><td rowspan="4">Tertiary Hospital #1

N = 48

*to be divided into two study variables: Intervention & Control Groups</td><td rowspan="2">Interventional Group

N = 24</td><td>1:2:3 ratio
(RPh, MD, RN)</td></tr>
<tr><td>Pharmacists (N = 4)
Physicians (N = 8)
Nurses (N = 12)</td></tr>
<tr><td rowspan="2">Control Group

N = 24</td><td>1:2:3 ratio
(RPh, MD, RN)</td></tr>
<tr><td>Pharmacists (N = 4)
Physicians (N = 8)
Nurses (N = 12)</td></tr>
</table>

The participant selection process will utilize a snowball sampling approach. In this, the (3) strata of potential participants comprising healthcare professionals within the selected Tertiary Hospital Departments are: 1) Physicians, 2) Nurses, and 3) Pharmacists. Following the stratification, a random assignment procedure will be used to allocate the healthcare workers into two participating groups: Interventional and Control. The process will be under the supervision and assistance of the Human Resources (HR) department of the hospital, connecting the researchers to the departments of the three (3) professions, as the HR department handles personnel-related operations. This involves the researchers complying with any requirements the HR department may ask for as needed.

2.4 Selection of Study Participants

The eligibility of the potential participants is identified through the inclusion and exclusion criteria. The inclusion criteria specifying that the eligible participants for this study are: 1) Licensed healthcare professionals: Physicians (MD), Nurses (Rn), and Pharmacists (RPh), 2) Health workers actively practicing either of the three (3) specified professions within the tertiary hospital located in Davao City, and 3) Healthcare professionals with NFC-enabled mobile devices. With this, a list from the hospital with three (3) sub-lists representing the professions: Physicians (MDs), Nurses (RNs), and Pharmacists (RPhs) are considered as eligible healthcare professionals. Hence, it could be inferred that the 1) Health workers other than the three specified professions (RPh, RN, MD), 2) Healthcare professionals working in hospitals other than the tertiary hospital located in Davao City, are to be excluded. Meanwhile, criterion number 3 will not be employed in selecting study participants for the control group. Therefore, the last criterion for a participant's eligibility will only be applied to the intervention group, which covers 3) Healthcare professionals with NFC-enabled mobile devices. In recognition of all participants for their invaluable time and significant contributions dedicated to advancing knowledge in the field of pharmacovigilance, each of them—whether assigned to the intervention or control group—will receive tokens and a certificate of appreciation upon completion of the study.

2.5 Data Collection Procedure

The researchers will be creating the intervention using an *A3 Sintra Board* with the NFC Tag, specifically the MIFARE Classic 1K 13.56MHz/Proximity Card attached to it. The researchers shall seek a letter of approval from the tertiary hospital in collaborating with the research at hand. With the given sample size of each medical professional, the researchers will be sending out informed consents, regarding the participation of the medical professionals in the study. Taking into consideration the freedom of the medical professional, the participant is free from choosing either to participate in or withdraw

from the study. Thereafter, the healthcare workers will be divided into various subgroups through the utilization of snowball sampling on the eligible participants where the number of sample population is calculated.

An in-depth discussion of the research proposal, to be conducted for one to three days, will be done to both the control group and the interventional group to give them an idea about their appropriate interventions to be studied during the incoming 1 month of data collection. A 10-minute face-to-face session will be conducted for healthcare workers assigned to the intervention group on the usage of Near Field Communication (NFC) tags for Adverse Drug Reaction reporting. This session will ensure that participants are familiar with Near Field Communication (NFC) tags, their purpose, and the reporting protocol. Choosing the appropriate participants with NFC compatible phones for the study will also be chosen here through a guided criteria containing the inclusion and exclusions of the study along with a list of phones that are not NFC compatible.

Several paraphernalia or standees with NFC Tags will be placed inside the hospital areas, specifically in department offices, where most healthcare professionals would quickly notice. The Near Field Communication (NFC) tag sends radio waves over a short distance, approximately four (4) inches, to trigger the reception antenna on a device to complete information exchange. The participants assigned to the interventional group shall first enable the "NFC" option to their Near Field Communication (NFC) compatible phones. Once enabled, the participant shall connect to the NFC tag through a simple tap on the intervention. After tapping, the smartphone will automatically proceed to the questionnaire.

A meeting shall be held with the chosen participants with NFC compatible phones for the intervention group, and the control group regarding the study at hand. Subsequently, the data collection will then begin wherein regular monitoring of the ADR reporting process will be conducted to ensure compliance, address any issues promptly, and ensure the accuracy and completeness of reported ADR data. The data collection is anticipated to continue for one (1) month to gather as much feedback regarding adverse drug reports as possible. Throughout the research endeavor, the mentor will provide guidance and support, accompanying the researchers during pivotal stages such as engaging with respondents and facilitating the distribution of post-test questionnaires. Moreover, if in any case that the hospital requires the researchers to conform with the hospital's Research Ethics Committee, the researchers shall conform with the protocols of each hospital's Research Ethics Committee (REC), regardless of the duration of time required for approval. Rest assured that the participant's privacy is safeguarded and not compromised during the conduct of the study. During this period, the participants from the interventional group shall utilize the Near Field Communication (NFC) tag intervention through tapping in order to report any encountered or suspected Adverse Drug Reactions.

Step 1: Briefing about the Research Study. Explain the goals and importance of ADR Reporting.	**Step 4:** Demonstrate the "TAP, WAIT, N GO" feature.
Step 2: Check phone compatibility of participants.	**Step 5:** Orient them about the Researchers' online form and FDA's reporting website.
Step 3: Teach them how to turn on NFC Tags functionality in their phone's settings.	**Step 6:** Reiterate what will happen during the whole duration of the conduct of the research.

Figure 2: Training guide for Medical Professional participants

The data collected from the report from the NFC tag will be directed immediately to and accessed by the Food and Drug Administration (FDA) Pharmacovigilance sector where the data will be stored and kept. After this period, the researchers will be meeting again with the same participants and the post-test questionnaire will be distributed. Then, the researchers will ask for access to the data collected and gathered in the Food and Drug Administration (FDA) Pharmacovigilance sector database to be analyzed and interpreted to determine if pharmacovigilance is prevalent in adverse drug reactions, analyze the rise or fall of engagements, and count the number of reports done within the period of utilization of the intervention. Moreover, the data analysis is made with the obtained results from the questionnaire provided and the Food and Drug Administration's system. The researchers, supported by an IT specialist, oversee the control of the NFC Tag and questionnaire, whereas participants from the intervention group exclusively access the post-test questionnaire located in the NFC tag for the data collection proper. Upon completion and submission of the post-test questionnaire on the designated website, participants are redirected to the FDA website to complete detailed reporting forms exclusively for submitted ADR reports. Researchers solely retain data provided within the questionnaire, including participant profession, sex, assigned group, and responses to post-test questionnaire queries, ensuring the absence of any personal information. The researchers will focus on the quantity of reports and its contents without breaching any personal information on the medical professional nor the patient.

Prior to the intervention, eligible participants, consisting of licensed healthcare professionals including physicians (MD), nurses (RN), and pharmacists (RPh) from the chosen tertiary hospital in Davao City equipped with NFC-enabled mobile devices, will be provided with an informed consent form. This form will ensure voluntary participation by outlining details such as confidentiality, benefits, and the right to decline or withdraw. After identifying potential participants meeting specified criteria, a stratified random sampling approach will be employed to select participants from each department within the hospital. Subsequently, participants will be randomly assigned to either the Interventional or Control group. Healthcare workers in the intervention group will undergo a 10-minute face-to-face training session aimed at familiarizing them with the use of NFC tags for reporting Adverse Drug Reactions (ADRs), emphasizing understanding of NFC tags and the reporting protocol. Informed Consent Forms, whether authorized or refused,

will be collected from participants during the meeting by the researchers. Moreover, distinct codes will be allocated to individual participants receiving the intervention to facilitate their identified group during Adverse Drug Reaction (ADR) reporting and data collection processes.

In this research endeavor, the researchers commit to providing adequate password protection for the gadgets utilized throughout the study. Recognizing the paramount importance of secure access controls, they will ensure that each device is equipped with robust authentication measures to safeguard against unauthorized access. Furthermore, various guidelines will be implemented towards the deletion of such data generated during the study. By adhering to these practices, they aim to uphold the highest standards of privacy protection and mitigate the risk of data breaches or privacy violations. In accordance with principles of transparency and academic integrity, the researchers will disclose their plan for presenting and publishing research data. They intend to adhere to established guidelines and standards within their field, ensuring that all findings are accurately and comprehensively reported. Prior to publication, the researchers will conduct a thorough review of the data to confirm its validity and relevance to the study objectives. Additionally, they will consider appropriate venues for dissemination. Throughout the process, the researchers will prioritize open communication and collaboration, seeking feedback from peers and stakeholders to enhance the quality and impact of their research.

2.6 Limitations of the Study

The primary aim of this research is to collect, analyze, and comprehend data pertaining to the regulation of medication safety, ultimately seeking to enhance secure medication usage among healthcare providers and consumers or patients. The scope of this study closely aligns with the research objective, which is to assess the influence of NFC tags on reporting adverse drug reactions (ADRs) within healthcare institutions in Davao City. Nonetheless, it is also crucial to recognize certain limitations in this study. A significant limitation is associated with compatibility and incompatibility of some smartphones towards Near Field Communication (NFC) tags. This limitation could pose challenges to the widespread adoption of NFC tags for pharmacovigilance. Furthermore, there is a prevalent knowledge gap among the general population concerning NFC tags and their potential applications, stemming from a lack of comprehensive education and exposure to this technology.

Table 3 – Summary of phones NFC compatible and not compatible

Compatible		**Not Compatible**	
Manufacturer	**Model**	**Manufacturer**	**Model**
Apple	iPhone 11	**Xiaomi**	Xiaomi Mi8 SE
	iPhone 11 Pro		Xiaomi Mi5
	iPhone 12		Xiaomi Mi5 Plus
	iPhone 12 Pro		Xiaomi Mi4i
	iPhone 13		Xiaomi Mi4c
	iPhone 13 Mini		Xiaomi Mi4s
	iPhone 13 Pro	**OnePlus**	OnePlus X
	iPhone 13 Pro Max		OnePlus 2
	iPhone 14	**Motorola**	Moto E7
	iPhone 14 Max		Moto E7 Plus
	iPhone 14 Pro		Moto G9

	iPhone 14 Pro Max		Moto G9 Play
	iPhone 15		Moto G9 Plus
	iPhone 15 Pro		Moto G9 Power
	iPhone 6		Moto G9 Lite
	iPhone 6s		Moto G8
	iPhone 6s Plus		Moto G8 Play
	iPhone 7		Moto G8 Plus
	iPhone 7 Plus		Moto G8 Power
	iPhone 8		Moto G8 Lite
	iPhone 8 Plus		Moto Z4
	iPhone SE 2020		Moto Z4 Play
	iPhone X		Moto Z4 Force
	iPhone Xr		Moto E5
	iPhone XS		Moto E5 Plus
	iPhone XS Max		Moto E5 Play
Asus	Padfone 2		Moto E5 Go
	Zenfone 5Z		Moto G7
	Zenfone 7		Moto G7 Play
	Zenfone 7 Pro		Moto G7 Plus
	Zenfone 8		Moto G7 Power
	Zenfone 8 Flip		Moto G6

Google	Nexus 5X		Moto G6 Plus
	Nexus 6P		Moto G6 Play
	Pixel		Moto E6
	Pixel 2		Moto E6 Play
	Pixel 3		Moto E6 Plus
	Pixel 4		Moto E6s
	Pixel 4a		Moto E4 Plus
	Pixel 5		Moto G5
	Pixel 5A		Moto G5s Plus
	Pixel 6		Moto G4
	Pixel 7		Moto G4 Plus
	Pixel XL	**LG**	LG K11 Plus
Honor	10		LG Q6
	10 Lite	**Nokia**	Nokia 1
	9		Nokia 2
	50		Nokia 2.1
	Magic 3		Nokia 3.1
	Magic 3 Pro		Nokia 6.1+
	Play	**HTC**	HTC Desire 12
	X7		HTC Desire 12+
HTC	Desire 610		HTC OneX10

	Desire 816		HTC OneM8
	Desire Eye		
	One (M8)		
	One M8s		
	One M9		
Huawei	Ascend G620S		
	Ascend P7		
	Mate 20 Pro		
	Mate 40		
	Mate x2		
	Nova 8		
	Nova 8 Pro		
	Nova 9		
	Nova 9 Pro		
	P20		
	P20 Pro		
	P30 Pro		
	P40		
	P40 Pro		
	P50		
	P50 Pro		

LG	G2	
	G2 Mini	
	G3	
	G4	
	G7 ThinQ	
	K52	
	K62	
	Optimus 4X HD	
	Optimus L5	
	Optimus L7 II	
	q52	
	V10	
	Wing	
Motorola	Defy	
	Edge 20	
	Edge 20 Lite	
	Edge 20 Pro	
	Edge 2021	
	G6	
	G6 Plus	
	Moto G10	

	Moto G20	
	Moto G30	
	Moto G50 5G	
	Moto G60	
	Moto X 2nd Gen	
	One-5G	
Nokia	G20	
	X20	
OnePlus	5T	
	6	
	6T	
	9 Pro	
	9 Pro 5G	
	9r	
	Ce-5G	
	Nord 2-5G	
Oppo	a94	
	Find x3 Pro	
	Reno 5	
	Reno 5 Pro	
	Reno 6	

	Reno 6 Pro	
	Reno8 5G	
Samsung	Galaxy A51	
	Galaxy A12	
	Galaxy A13	
	Galaxy A3	
	Galaxy A3 (2016)	
	Galaxy A32	
	Galaxy A5	
	Galaxy A5 (2016)	
	Galaxy A52	
	Galaxy A52 s	
	Galaxy A53	
	Galaxy A71	
	Galaxy A72	
	Galaxy A8	
	Galaxy A9	
	Galaxy Alpha	
	Galaxy Core Advance	
	Galaxy Core Prime	
	Galaxy Express 2	

	Galaxy F22	
	Galaxy F62	
	Galaxy Fame	
	Galaxy J1	
	Galaxy J5	
	GalaxyJ5 (2016)	
	Galaxy J6	
	Galaxy J6+	
	Galaxy K Zoom	
	Galaxy M12	
	Galaxy M32	
	Galaxy M42	
	Galaxy M62	
	Galaxy Mega	
	Galaxy Note 3 Neo Duos	
	Galaxy Note 4	
	Galaxy Note 7	
	Galaxy Note 8	
	Galaxy Note 9	
	Galaxy Note 20	

	Galaxy Note 20 Ultra 5G	
	Galaxy Quantum 2	
	Galaxy S10	
	Galaxy S10+	
	Galaxy S20	
	Galaxy S20+	
	Galaxy S21	
	Galaxy S22	
	Galaxy S22 Ultra	
	Galaxy S23	
	Galaxy S23 Ultra	
	Galaxy S23+	
	Galaxy S3	
	Galaxy S5	
	Galaxy S6	
	Galaxy S6 Edge	
	Galaxy S7	
	Galaxy S7 Edge	
	Galaxy S8	
	Galaxy S9	
	Galaxy S9+	

	Galaxy Xcover 3	
	Galaxy Xcover 5	
	Galaxy Young	
	Galaxy Z Flip3	
	Galaxy Z Flip4	
	Galaxy Z Fold 2	
	Galaxy Z Fold 3	
	S21 Ultra 5G	
	S5 Neo	
	S6 edge+	
Sony	Xperia 10iii	
	Xperia 10iii Lite	
	Xperia 1iii	
	Xperia 5ii	
	Xperia C4	
	Xperia E1	
	Xperia E3	
	Xperia E5	
	Xperia L1	
	Xperia M2	
	Xperia M4 Aqua	

	Xperia M5	
	Xperia T2 Ultra	
	Xperia X	
	Xperia X Compact	
	Xperia X Performance	
	Xperia XA	
	Xperia XA Ultra	
	Xperia XA1	
	Xperia XA1 Ultra	
	Xperia XZ	
	Xperia XZ Premium	
	Xperia XZ2	
	Xperia XZ3	
	Xperia Z	
	Xperia Z1 Compact	
	Xperia Z2	
	Xperia Z3 Compact	
	Xperia Z5	
	Xperia Z5 Compact	
	Xperia Z5 Premium	
Vivo	Iqoo Neo 5	

	X51	
	X60 Pro	
	X70	
Xiaomi	Black Shark	
	Redmi 9	
	Redmi K40	
	Redmi Note 10 Pro	
	Mi 8	

In addition to the identified limitations, it is crucial to emphasize the significance of putting strong password security measures in place on smartphones and other devices that are compatible with Near Field Communication (NFC) technology. Securing device access is essential to prevent unwanted access and potential breaches, especially considering the sensitive nature of data pertaining to adverse drug reactions (ADRs) and medication safety. For NFC tags to be successfully deployed in healthcare facilities, the overall security infrastructure must be enhanced. This can be achieved by strengthening password protocols on compatible devices.

2.6 Data Analysis

In assessing the impact of NFC tags on ADR reporting within healthcare institutions in Davao City, quantitative methodologies were employed for data analysis. The intervention was carried out at a tertiary hospital for one month, during which the number of ADR reports was collected in the researchers' database. Subsequently, post-tests were conducted with participants from both study groups, and the collected data underwent analysis using the following statistical methodologies:

1. **Comparative Analysis of Knowledge and Awareness Levels**

To evaluate the impact of NFC tags, an independent sample t-test was conducted to compare post-intervention knowledge and awareness levels between the control and interventional groups. This analysis focused on identifying significant differences in understanding and awareness of ADR reporting facilitated by NFC tags among pharmacists, physicians, and nurses.

2. **Prevalence of ADR Reports**

Descriptive statistics, including frequencies, were used to summarize ADR reports categorized by various parameters such as types of medications, signs and symptoms, types of ADRs, possible medication errors, and outcomes. Additionally, a chi-square test was employed to explore the prevalence of ADR reports across different healthcare professionals (pharmacists, physicians, and nurses), aiming to detect significant variations in the distribution of reported ADRs among these groups.

3. **Correlation Analysis**

Moreover, a correlation analysis was performed to investigate the relationship between the utilization of NFC tags and the frequency of ADRs reported. This analysis quantified the strength and direction of this relationship, providing insights into how NFC tags influenced ADR reporting practices among participating healthcare professionals.

4. **Effectiveness of NFC Tags**

Ultimately, an independent sample t-test was utilized to assess the effectiveness of NFC tags in increasing ADR reporting rates. By comparing ADR reporting rates between the interventional and control groups, the statistical test could deduce whether NFC tags had a statistically significant impact on enhancing ADR reporting within the healthcare setting.

3. RESULTS & DISCUSSION

This chapter presents the comprehensive data gathered during the integration of the intervention and the survey questionnaire phase of the study, which aims to evaluate the effectiveness of Near Field Communication (NFC) Tags in increasing the prevalence of Adverse Drug Reaction reportings through the FDAs Pharmacovigilance Sector amongst healthcare workers in a Tertiary Hospital of Davao City. Descriptive and inferential statistics were used to address the research questions and hypotheses outlined in the study. A total of 48 respondents completed and returned the questionnaire within the given timeframe of one (1) month. Out of the 48 respondents, 8 (16.67%) were Pharmacists, 16 (33.33%) were Physicians, and 24 (50%) were Nurses.

3.1 Level of Knowledge of ADR Reporting

This part compares the knowledge of Adverse Drug Reaction (ADR) Reporting of pharmacists, physicians, and nurses in a tertiary hospital in Davao City. This test was to ensure how knowledgeable these healthcare workers are in reporting ADRs while using their assigned intervention.

Table 4

Table 4.A - Level of Knowledge on Pharmacovigilance of Nurses

Knowledge	SA	A	N	D	SD
Pharmacovigilance refers to the detection, assessment, and prevention of adverse effects and other drug-related problems	19 (82.61)	4 (17.39)	1 (4.35)	0 (0.0)	0 (0.0)
Pharmacovigilance refers to the science and activities involved in reporting adverse drug reactions	15 (65.22)	8 (34.78)	1 (4.35)	0 (0.0)	0 (0.0)
Pharmacovigilance refers to the process by which adverse drug reactions are monitored in a hospital	13 (56.52)	10 (43.50)	1 (4.35)	0 (0.0)	0 (0.0)
Pharmacovigilance is a practice focused on medication and patient safety	16 (69.57)	7 (30.43)	1 (4.35)	0 (0.0)	0 (0.0)
Pharmacovigilance and Adverse Drug Reactions are the same	5 (21.74)	11 (47.83)	5 (21.74)	3 (13.04)	0 (0.0)
I am well-informed about the ADR reporting process.	4 (17.39)	7 (30.43)	7 (30.43)	6 (26.09)	0 (0.0)
An adverse drug reaction is a side effect that is commonly experienced when a patient is using a drug.	6 (26.09)	8 (34.78)	3 (13.04)	1 (4.35)	6 (26.09)
An adverse drug reaction is a predicted and expected reaction to a drug.	6 (26.09)	6 (26.09)	5 (21.74)	3 (13.04)	4 (17.39)
An adverse reaction can only be experienced by a patient using orthodox medicines.	1 (4.35)	4 (17.39)	9 (39.13)	7 (30.43)	3 (13.04)
An adverse drug reaction can be experienced by a patient using herbal/traditional medicines.	1 (4.35)	6 (26.09)	12 (52.17)	4 (17.39)	1 (4.35)
All adverse drug reactions are known before the drug gets into the market for use.	3 (13.04)	6 (26.09)	7 (30.43)	4 (17.39)	4 (17.39)
All adverse drug reactions experienced by a patient taking a drug should be reported to the FDA.	17 (73.91)	7 (30.43)	0 (0.0)	0 (0.0)	0 (0.0)
All adverse drug reactions experienced by a patient taking a drug should be documented by the pharmacist.	15 (65.22)	8 (34.78)	1 (4.35)	0 (0.0)	0 (0.0)

Only intolerable reactions to a drug should be reported to the FDA.	2 (8.70)	5 (21.74)	5 (21.74)	10 (43.50)	2 (8.70)
Only counseled patients with Adverse Drug Reaction should be reported to the FDA.	4 (17.39)	2 (8.70)	6 (26.09)	10 (43.50)	2 (8.70)
The best method of addressing adverse effects is to use or recommend another drug.	3 (13.04)	8 (34.78)	10 (43.50)	3 (13.04)	0 (0.0)
There is a need to report an adverse drug reaction that is already documented in drug literature insert.	7 (30.43)	12 (52.17)	3 (13.04)	0 (0.0)	2 (8.70)
The training provided has thoroughly prepared me for ADR reporting.	2 (8.70)	10 (43.50)	11 (47.83)	1 (4.35)	0 (0.0)
Reporting and documentation of adverse drug reactions is important in improving the health and well-being of the patient.	16 (69.57)	7 (30.43)	1 (4.35)	0 (0.0)	0 (0.0)
I feel confident in reporting ADRs despite knowing the risks.	3 (13.04)	10 (43.50)	10 (43.50)	1 (4.35)	0 (0.0)

Table 4.B - Level of Knowledge on Pharmacovigilance of Physicians

Knowledge	**SA**	**A**	**N**	**D**	**SD**
Pharmacovigilance refers to the detection, assessment, and prevention of adverse effects and other drug-related problems	11 (68.75)	5 (31.25)	0 (0.0)	0 (0.0)	0 (0.0)
Pharmacovigilance refers to the science and activities involved in reporting adverse drug reactions	10 (62.50)	6 (37.50)	0 (0.0)	0 (0.0)	0 (0.0)
Pharmacovigilance refers to the process by which adverse drug reactions are monitored in a hospital	11 (68.75)	4 (25.0)	1 (6.25)	0 (0.0)	0 (0.0)
Pharmacovigilance is a practice focused on medication and patient safety	11 (68.75)	5 (31.25)	0 (0.0)	0 (0.0)	0 (0.0)
Pharmacovigilance and Adverse Drug Reactions are the same	0 (0.0)	4 (25.0)	4 (25.0)	6 (37.50)	2 (12.50)
I am well-informed about the ADR reporting process.	0 (0.0)	5 (31.25)	5 (31.25)	6 (37.50)	0 (0.0)
An adverse drug reaction is a side effect that is commonly experienced when a patient is using a drug.	1 (6.25)	6 (37.50)	1 (6.25)	5 (31.25)	3 (18.75)
An adverse drug reaction is a predicted and expected reaction to a drug.	0 (0.0)	4 (25.0)	3 (18.75)	3 (18.75)	6 (37.50)
An adverse reaction can only be experienced by a patient using orthodox medicines.	0 (0.0)	2 (12.50)	3 (18.75)	5 (31.25)	6 (37.50)
An adverse drug reaction can be experienced by a patient using herbal/traditional medicines.	3 (18.75)	8 (50.0)	4 (25.0)	1 (6.25)	0 (0.0)
All adverse drug reactions are known before the drug gets into the market for use.	2 (12.50)	4 (25.0)	4 (25.0)	3 (18.75)	3 (18.75)

All adverse drug reactions experienced by a patient taking a drug should be reported to the FDA.	8 (50.0)	7 (43.75)	1 (6.25)	0 (0.0)	0 (0.0)
All adverse drug reactions experienced by a patient taking a drug should be documented by the pharmacist.	7 (43.75)	6 (37.50)	2 (12.50)	1 (6.25)	0 (0.0)
Only intolerable reactions to a drug should be reported to the FDA.	2 (12.50)	3 (18.75)	2 (12.50)	7 (43.75)	2 (12.50)
Only counseled patients with Adverse Drug Reaction should be reported to the FDA.	2 (12.50)	0 (0.0)	6 (37.50)	6 (37.50)	2 (12.50)
The best method of addressing adverse effects is to use or recommend another drug.	1 (6.25)	1 (6.25)	4 (25.0)	9 (56.25)	1 (6.25)
There is a need to report an adverse drug reaction that is already documented in drug literature insert.	6 (37.50)	5 (31.25)	4 (25.0)	1 (6.25)	0 (0.0)
The training provided has thoroughly prepared me for ADR reporting.	0 (0.0)	2 (12.50)	9 (56.25)	4 (25.0)	1 (6.25)
Reporting and documentation of adverse drug reactions is important in improving the health and well-being of the patient.	7 (43.75)	8 (50.0)	1 (6.25)	0 (0.0)	0 (0.0)
I feel confident in reporting ADRs despite knowing the risks.	1 (6.25)	6 (37.50)	8 (50.0)	1 (6.25)	0 (0.0)

Table 4.C - Level of Knowledge on Pharmacovigilance of Pharmacists

Knowledge	**SA**	**A**	**N**	**D**	**SD**
Pharmacovigilance refers to the detection, assessment, and prevention of adverse effects and other drug-related problems	6 (75.0)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)
Pharmacovigilance refers to the science and activities involved in reporting adverse drug reactions	7 (87.50)	1 (12.50)	0 (0.0)	0 (0.0)	0 (0.0)
Pharmacovigilance refers to the process by which adverse drug reactions are monitored in a hospital	5 (62.50)	3 (37.50)	0 (0.0)	0 (0.0)	0 (0.0)
Pharmacovigilance is a practice focused on medication and patient safety	6 (75.0)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)
Pharmacovigilance and Adverse Drug Reactions are the same	0 (0.0)	2 (25.0)	5 (62.50)	1 (12.50)	0 (0.0)
I am well-informed about the ADR reporting process.	0 (0.0)	1 (12.50)	6 (75.0)	1 (12.50)	0 (0.0)
An adverse drug reaction is a side effect that is commonly experienced when a patient is using a drug.	3 (37.50)	1 (12.50)	0 (0.0)	3 (37.50)	1 (12.50)
An adverse drug reaction is a predicted and expected reaction to a drug.	0 (0.0)	2 (25.0)	1 (12.50)	3 (37.50)	2 (25.0)
An adverse reaction can only be experienced by a patient using orthodox medicines.	0 (0.0)	4 (50.0)	2 (25.0)	1 (12.50)	1 (12.50)
An adverse drug reaction can be experienced by a patient using herbal/traditional medicines.	3 (37.50)	3 (37.50)	0 (0.0)	2 (25.0)	0 (0.0)
All adverse drug reactions are known before the drug gets into the market for use.	0 (0.0)	1 (12.50)	3 (37.50)	2 (25.0)	2 (25.0)
All adverse drug reactions experienced by a patient taking a drug should be reported to the FDA.	5 (62.50)	3 (37.50)	0 (0.0)	0 (0.0)	0 (0.0)

All adverse drug reactions experienced by a patient taking a drug should be documented by the pharmacist.	6 (75.0)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)
Only intolerable reactions to a drug should be reported to the FDA.	3 (37.50)	1 (12.50)	2 (25.0)	1 (12.50)	1 (12.50)
Only counseled patients with Adverse Drug Reaction should be reported to the FDA.	2 (25.0)	1 (12.50)	1 (12.50)	3 (37.50)	1 (12.50)
The best method of addressing adverse effects is to use or recommend another drug.	0 (0.0)	2 (25.0)	2 (25.0)	4 (50.0)	0 (0.0)
There is a need to report an adverse drug reaction that is already documented in drug literature insert.	1 (12.50)	5 (62.50)	2 (25.0)	0 (0.0)	0 (0.0)
The training provided has thoroughly prepared me for ADR reporting.	0 (0.0)	3 (37.50)	3 (37.50)	2 (25.0)	0 (0.0)
Reporting and documentation of adverse drug reactions is important in improving the health and well-being of the patient.	5 (62.50)	3 (37.50)	0 (0.0)	0 (0.0)	0 (0.0)
I feel confident in reporting ADRs despite knowing the risks.	1 (12.50)	3 (37.50)	3 (37.50)	1 (12.50)	0 (0.0)

Table 4 shows the knowledge of the healthcare workers in a Tertiary Hospital of Davao City in reporting Adverse Drug Reactions through the FDAs Pharmacovigilance Sector. Based on the data presented, the respondents are knowledgeable in terms of the definition of Pharmacovigilance with 19 (82.61%) of Nurses, 11 (68.75%) of Physicians, and 6 (75%) of Pharmacists correctly define Pharmacovigilance as the detection, assessment, and prevention of adverse effects and other drug-related problems. In addition to the definition, 15 (62.22%) of Nurses, 10 (62.50%) of Physicians, and 7 (87.50%) of Pharmacists agree to the definition of Pharmacovigilance as the science and activities involved in reporting adverse drug reactions. The high percentage of respondents strongly agreeing to the definition of Pharmacovigilance indicates they are informed of a present reporting system for adverse drug reactions.

Despite the respondents being knowledgeable, it is very important to note that 6 (26.09%) of Nurses and 6 (37.50%) of Physicians do not agree that they are well-informed as to how the process of Adverse Drug Reactions occurs. It is comparable to the 1 (12.50%) of Pharmacists who do not agree that they are well informed out of the 6 (75%) and 1 (12.50%) of Pharmacists who agree and are neutral about how the ADR reporting process occurs. Additionally, it is also stated that 11 (47.83%) of Nurses, 9 (56.25%) of Physicians, and 3 (37.50%) of Pharmacists are neutral as to the training provided by them in terms of preparation for ADR reporting. The uncertainty of the training provided by them in terms of ADR reporting could influence their decision to not be well-informed about the ADR reporting process. This is backed by a Systematic Review by Garcia-Abeijon et al. (2023) showing that lack of feedback from the national regulatory authorities, lack of training, and lack of enough information about the patient is identified as a factor related to the underreporting of Adverse Drug Reactions by Healthcare professionals [65].

Notably, 3 (37.50%) of Pharmacists are the least knowledgeable in terms of agreeing that only intolerable reactions should be reported. In comparison to this, 10 (43.50%) of Nurses and 7 (43.75%) of Physicians disagree that only intolerable reactions should be reported to the FDA which is correct because an article by the National Institute of Healthcare and Excellence from the UK tells us that an adverse drug reaction should be reported whether tolerable or intolerable [66].

However, while the Nurses and Physicians correctly identified that tolerable and intolerable reactions are supposed to be reported, 6 (26.09%) of Nurses and 4 (25%) of Physicians incorrectly identified that all adverse drug reactions are known before a drug enters the market. In comparison to this, no Pharmacists agreed to this and instead, 3 (37.50%) remained neutral on the matter while 2 (25.0%) of them both disagreed and strongly disagreed with the statement which is correct. It is important to take note that the Pharmacovigilance system of the FDA is supposed to be a means to assess drugs for Post-Marketing surveillance purposes. Such instances may be attributed to an example by Berlin et al., wherein health care professionals and patients are more inclined to report adverse reactions when a drug is newly introduced, when the events are medically very significant, when the event occurs very close in time to the administration of treatment, or when negative publicity emerges, such as the increased number of cases of rotavirus vaccine–associated intussusception reported [67].

Although the respondents show knowledgeable status in terms of the definition of Pharmacovigilance, 10 (43.50%) of Nurses, 8 (50%) of Physicians, and 3 (37.50%) of Pharmacists remain neutral in terms of their confidence in reporting Adverse Drug Reactions through the FDAs Pharmacovigilance sector. The respondent's neutrality may be a result of the poor knowledge status in what type of adverse reaction to report and as to how to report on an adverse reaction as evident by the data presented in Table 4.

3.2 Level of Awareness of ADR Reporting

This part compares the awareness level of Adverse Drug Reaction (ADR) Reporting of pharmacists, physicians, and nurses in a tertiary hospital of Davao City. This test was to ensure how aware these healthcare workers are in reporting ADRs while using their assigned intervention.

Table 5 - Awareness level of healthcare workers in ADR reporting

Pharmacovigilance Awareness	**Interventional Group**			**Control**		
	Pharma	**Doctor**	**Nurses**	**Pharma**	**Doctor**	**Nurses**
Yes	4 (100.0)	8 (100.0)	10 (83.33)	4 (100.0)	8 (100.0)	8 (66.67)
No	0 (0.0)	0 (0.0)	2 (16.67)	0 (0.0)	0 (0.0)	4 (33.33)
Discovery of existing Pharmacovigilance						
From other healthcare professionals	3 (75.0)	2 (25.0)	5 (41.67)	1 (25.0)	4 (50.00)	8 (66.67)
Through seminar and training	1 (25.0)	5 (62.50)	2 (16.67)	1 (25.0)	2(25.00)	2 (16.67)
From Medical School	1 (25.0)	4 (50.0)	4 (33.33)	2 (50.0)	5 (62.50)	3 (25.0)
Advertisement	0 (0.0)	0 (0.0)	2 (16.67)	0 (0.0)	1 (25.0)	2 (16.67)
Internet	0 (0.0)	0 (0.0)	3 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)
Others: _____	0 (0.0)	1 (12.50)	2 (16.67)	1 (25.0)	8 (100.0)	0 (0.0)
System Familiarity						
Yes	2 (50.0)	3 (37.50)	7 (58.33)	1 (0.0)	2 (25.0)	3 (25.0)
No	2 (50.0)	5 (62.50)	5 (41.67)	4 (100.0)	6 (75.0)	9 (75.0)
Who should report ADRs?						
Physicians	1 (25.0)	6 (75.0)	11 (91.67)	0 (0.0)	6 (75.0)	9 (75.0)
Pharmacists	4 (100.0)	6 (75.0)	4 (33.33)	4 (100.0)	5 (62.50)	9 (75.0)
Nurses	0 (0.0)	6 (75.0)	6 (50.0)	0 (0.0)	5 (62.50)	8 (66.67)
Patients	0 (0.0)	1 (12.50)	2 (16.67)	0 (0.0)	0 (0.0)	1 (8.33)
Senior Pharmacists	1 (25.0)	3(37.50)	3 (25.0)	1 (25.0)	4 (50.0)	4 (33.33)
Senior Physicians	0 (0.0)	2 (25.0)	4 (33.33)	0 (0.0)	3 (25.0)	4 (33.33)
Senior Nurses	0 (0.0)	2 (25.0)	4 (33.33)	0 (0.0)	4 (50.0)	4 (33.33)
Awareness on Existing ADR Reporting System in the Hospital						
Yes	2 (50.0)	4 (50.0)	7 (58.33)	2 (50.0)	2 (25.0)	8 (66.67)
No	2 (50.0)	4 (50.0)	5 (41.67)	2 (50.0)	6 (75.0)	4 (33.33)
Encounter on ADR						
Yes, I have encountered 1 or 2 ADR during my duty in the hospital	0	3(37.50)	4 (33.33)	1 (25.0)	1 (12.50)	1 (8.33)
Yes, I have encountered 3 or more ADRs during my duty in the hospital.	0 (0.0)	1 (12.50)	0 (0.0)	0 (0.0)	1 (12.50)	0 (0.0)
I have not encountered an ADR during my duty in the hospital.	4 (100.0)	4 (50.0)	8 (66.67)	3 (75.0)	6 (75.0)	11 (91.67)
Joined Seminars						

Yes	1 (25.0)	1 (12.50)	1 (8.33)	1 (25.0)	2 (25.0)	3 (25.0)
No	3 (75.0)	7 (87.50)	11 (91.67)	3 (75.0)	6 (75.0)	9 (75.0)
Awareness on ADR Reporting Benefits						
Yes, I am aware of the benefits.	4 (100.0)	5 (62.50)	8 (66.67)	3 (75.0)	6 (75.0)	6 (50.))
No, I am not aware of the benefits.	0 (0.0)	3 (37.50)	4 (33.33)	1 (25.0)	2 (25.0)	6 (50.0)
Challenges						
Underreporting	2 (50.0)	5 (62.50)	7 (58.33)	2 (50.0)	7 (87.50)	6 (50.0)
Lack of Awareness	3 (75.0)	7 (87.50)	9 (75.0)	4 (100.0)	5 (62.50)	11 (91.66)
Time Constraints	2 (50.0)	4 (50.0)	2 (16.67)	1 (25.0)	5 (62.50)	1 (8.33)
Fear of Consequences	4 (100.0)	3 (37.50)	2 (16.67)	1 (25.0)	0 (0.0)	5 (41.66)
Uncertainty of Casualties	2 (50.0)	4 (50.0)	2 (16.67)	1 (25.0)	0 (0.0)	2(16.66)
Complexity of Reporting Systems	2 (50.0)	5 (62.50)	3 (25.0)	3 (75.0)	4 (50.0)	2(16.66)
Inadequate Training	1 (25.0)	5 (62.50)	5 (41.67)	0 (0.0)	6 (75.0)	2(16.66)
Stigma Related to Reporting	2 (50.0)	1 (12.50)	1 (8.33)	0 (0.0)	2 (25.0)	3 (25.0)
Others: _____	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Contribution of reporting ADRs						
Early Detection of Safety Concerns related to the medication prescribed by the physician.	4 (100.0)	6 (75.0)	8 (66.67)	2 (25.0)	6 (75.0)	7 (58.33)
Contribute to Future Drug Developments such as Drug Labels, Contraindications, Appropriate Usage, and potential Adverse Effects	2 (25.0)	8 (100.0)	6 (50.0)	2 (25.0)	6 (75.0)	6 (50.0)
Quality Improvement in Healthcare Delivery	3 (75.0)	6 (75.0)	8 (66.67)	0 (0.0)	6 (75.0)	7 (58.33)
Assisting in Risk-Benefit Assessment	2 (25.0)	6 (75.0)	4 (33.33)	0 (0.0)	4 (50.0)	4 (33.33)
Encourages Patients and Healthcare workers to become more active in ADR reporting	3 (75.0)	5 (62.50)	6 (50.0)	4 (100.0)	4 (50.0)	5 (41.67)

Table 5 shows the awareness level of healthcare workers in a tertiary hospital of Davao City in terms of ADR reporting. The data shows that all 8 (100%) pharmacists and 16 (100%) doctors are aware of a Pharmacovigilance system in the Philippines except for nurses with 2 (16.67%) and 4 (33.33%) not aware of a Pharmacovigilance system. In relation to this, the data shows that 4 (50%) of pharmacists, 4 (50%) and 6 (75%) of doctors, and 5 (41.67%) and 4 (33.33%) of nurses do not know of an existing ADR reporting system in the tertiary hospital. This then influences the choices of nurses claiming that challenges faced in reporting ADRs are underreporting and lack awareness with 7 (58.33%) and 6 (50%) ; and 9 (75.0%) and 11 (91.66%) consecutively. These findings are consistent with a study by Adisa & Omitogun (2019) wherein a majority of the respondents in the study conducted have also heard of pharmacovigilance but have less heard of or come across an ADR reporting form [68]. Additionally, it can be also seen from a study by Almandil, N. (2016) in which it's results showed that 44.9% of participants stated that they were unaware of the existence of a hospital reporting system and whereas 30.5% did not know whether a system was available in the hospital [69]. This is one of the reasons why the researchers decided to initiate the RESETA initiative in order to provide a way for healthcare providers such as pharmacists, nurses, and doctors to report ADRs faster and more efficiently.

However, it is important to note that almost half of the respondents are aware of an existing reporting system in the designated tertiary hospital with 4 (50%) of Pharmacists ; 4 (50%) and 2 (25%) of doctors, and 7 (58.33%) and 8 (66.67%) of nurses. But despite of the awareness, 4 (100%) and 3 (75%) of pharmacists, 4 (50%) and 6 (75%) of doctors, and 8 (66.67%) and 11 (91.67%) of nurses have never encountered an ADR during duty in the tertiary hospital. This then supports the claim by Sandberg et al. (2022) that the medication may have a strong safety profile, characterized by a low incidence of side effects [64] which may reason out as to why there are low ADR reporting incidences in Davao City.

Additionally, the data also shows the healthcare workers agreeing to the fact that one of the many challenges faced in reporting ADRs is due to the complexity of the reporting system and inadequate training. 2 (50%) and 3 (75%) of pharmacists and 5 (62.50%) and 4 (50%) of doctors agree with the

complexity of the ADR reporting system. Moreover, only doctors agree that inadequate training is a major factor with data of 5 (62.50%) and 6 (75%). Which is why through the implementation of the RESETA initiative, the researchers would aim to have an easier way of accessing the online ADR reporting forms of the FDA in order to promote ease of use, satisfaction, and usefulness of the mode as interpreted and discussed in table 7, 8, and 9.

Lastly, the data shows that 4 (100%) and 3 (75%) of pharmacists, 5 (62.50%) and 6 (75%) of doctors, and 8 (66.67%) and 6 (50%) of nurses are aware of the benefits of reporting ADRs. In line with this data, it goes to show that among pharmacists, 4 (100%) and 2 (25%) agree that ADR reporting contributes to the early detection of safety concerns related to prescribed medications. Among physicians, 12 (75%) reported this contribution, while among nurses, 8 (66.67%) and 7 (58.33%) acknowledged the same. Regarding future drug developments such as Drug Labels, Contraindications, Appropriate Usage, and Potential Adverse Effects, 4 (25%) of pharmacists, 8 (100%) and 6 (75%) of physicians, and 12 (50%) of nurses reported that ADR reporting contributes to these areas. In terms of encouraging patients and healthcare workers to become more active in ADR reporting, 3 (75%) and 4 (100%) of pharmacists, 5 (62.50%) and 4 (50%) of physicians, and 6 (50%) and 5 (41.67%) of nurses reported positive impacts. This is consistent with a study by Sienkiewics et al. (2022) in which they discussed that the contribution of reporting ADRs provided additional and complementary information to healthcare professionals' data; and obtaining follow-up data in medicines during post-marketing surveillance [70].

3.3 Prevalence of ADR Reports

This part assesses the overall effectiveness of the Near Field Communication (NFC) tags in a tertiary hospital of Davao City. Before assessing the overall effectiveness, the study must first assess the prevalence of ADR reports and its significant relationship to the increase in ADR reports.

Table 6 - Prevalence of Adverse Drug Reaction Reports

What are the common medications usually reported using your assigned intervention?	Nurses	Pharma	Doctors
Antimicrobials	0	0	1
Antivirals	0	0	0
Antifungal	0	0	0
Anthelmintic	0	0	0
Antiprotozoal	0	0	0
Antihypertensives	0	0	1
Antiplatelets	0	0	0
Cytotoxic	0	0	0
Immunosuppressants	0	0	0
Diuretics	0	0	0
Antidiabetics	0	0	0
Beta-Blockers	0	0	0
NSAIDs	0	0	0
Antineoplastics	0	0	0
Bronchodilators	0	0	0
Hormonal Suppressants	0	0	0
Drugs for Parkinsonism	0	0	0
Anesthetics	0	0	0
Antacids	0	0	0
Proton Pump Inhibitors	0	0	0
Not Mentioned: _____	0	0	0

What are the common signs and symptoms usually reported using your assigned intervention?			
Urticaria	0	0	0
Blisters	0	0	0
Blurry Vision	0	0	0
Severe Swelling or Itching	0	0	0
Toxic Epidermal Necrolysis	0	0	0
Throat Tightness	0	0	0
Tingling	0	0	0
Nausea and Vomiting	0	0	1
Anaphylactic Shock	0	0	0
Not mentioned: _____	0	0	1
Type of ADR usually reported?			
Type A (Augmented)	0	0	0
Type B (Bizarre)	0	0	0
Type C (Chronic)	0	0	0
Type D (Delayed)	0	0	1
Type E (End of Use)	0	0	0
Type F (Failure of Treatment)	0	0	0
Type of medication error?			
Prescribing	0	0	0
Omission	0	0	0
Wrong Time	0	0	1
Unauthorized Drug	0	0	0
Wrong Dose Prescription	0	0	0
Administration errors (Incorrect route of administration, giving the drug to the wrong patient, extra dose, or wrong rate)	0	0	1
Monitoring errors (Failing to take into account patient liver and renal function, failing to document allergy or potential for drug interaction)	0	0	0
Compliance errors (Not following protocol or rules established for dispensing and prescribing medications)	0	0	0
Outcome of ADR:			
Death	0	0	0
Life-threatening	0	0	1
Disabling / Incapacitating	0	0	0

Caused / Prolonged hospitalization	0	0	0
Congenital Anomaly / Birth Defect	0	0	0
Other medically important condition	0	0	0

Table 6 presents data on Adverse Drug Reaction (ADR) reports by the selected healthcare workers (pharmacists, doctors, and nurses) at a tertiary hospital in Davao City, revealing a significant trend of minimal reporting across various categories within one (1) month of implementation of integration. The data shows that doctors predominantly reported incidents, particularly in the categories of antimicrobials (1 report) and antihypertensives (1 report), with each type reported once. Pharmacists and nurses did not report any incidents in these categories.

As the data showed that commonly reported medications that cause ADRs include antimicrobials and antihypertensives, various factors could contribute to this prevalence. One factor is the use of these medications without professional guidance from a doctor or pharmacist. For instance, a study by Barber et al. found that antibiotics can often be obtained from non-medical sources, such as local sari-sari stores, where they are available without expiration information or a prescription, particularly in the Philippines and similar Southeast Asian countries [71]. Additionally, an article from the DOST shows that another contributing factor to the frequent reporting of these drugs is the high prevalence of their use, as evidenced by the increased utilization of antihypertensive medications in 2018–2019 in the Philippines [72]. Furthermore, the symptom primarily reported by doctors is nausea and vomiting (1 report) as the sole documented symptom. Additionally, one unspecified symptom was reported (1 report). A study by Farida & Tsalatsatun has shown that nausea and vomiting are common adverse drug reactions reported after using an antihypertensive drug such as amlodipine [73]. The prevalence aligns with various studies that have established nausea or vomiting as potential outcomes of several over-the-counter and prescription medications [74].

In terms of ADR types, the data indicate a predominant reporting of Type D (Delayed) reactions, with doctors noting a single instance (1 report). This type of ADR is frequently reported because Type D ADR often occurs significantly after the medication has been administered [75]. Meanwhile, the doctors also reported isolated cases of medication errors, specifically wrong time errors (1 report) and administration errors (1 report). According to a study by MacDowell et al, this prevalence could also be attributed to the frequent occurrence of administration errors such as incorrect dosage, missed doses, and administering the wrong medication [76]. Furthermore, doctors reported one case (1 report) of a life-threatening outcome associated with ADRs. This aligns with the fact that it is established that severe or fatal adverse drug reactions may not manifest during clinical trials. Consequently, these reactions may only become evident after widespread public use of a medication.

As reflected in the overall findings, results show that doctors are more active towards Adverse Drug Reactions (ADRs) than nurses and pharmacists. Consistent with this, a study by Srisuriyachanchai et al which involves healthcare professionals, including physicians, nurses, and pharmacists revealed that respondents predominantly relayed suspected ADR symptoms to physicians responsible for patient care (81.5%). This inclination is supported by doctors demonstrating the highest mean attitude score towards the vigilance and reporting of ADRs. Moreover, doctors participate more in the management of a patient's signs and symptoms as well as ADRs rather than nursing and pharmacists [78].

Ultimately, the low prevalence of reporting adverse drug reactions (ADRs) cannot be solely attributed to ineffective integration; rather, it is influenced by multiple factors. In a study by Li et al., key findings involving the underreporting of hospital-based healthcare professionals highlight the necessity for educational initiatives, training programs, and improvements in the work environment to streamline ADR reporting processes. Also, the implementation of electronic tools integrated with hospital systems is recommended to simplify reporting and potentially increase reporting rates. Moreover, addressing clinician workload and reinforcing the importance of ADR reporting are essential steps toward enhancing pharmacovigilance efforts and ensuring patient safety [79].

3.4 Level of Effectiveness in Terms of Usefulness, Ease of Use, and Satisfaction

This part assesses the overall level of effectiveness of the ADR reporting system in terms of usefulness, ease of use, and level of satisfaction—Measuring Usability with the USE Questionnaire as adopted from Lund, A.M. (2001) [80]. Tests used are the mean and standard deviation which is appropriate to properly analyze and interpret the given data presented below.

Table 7 - Level of Effectiveness of the ADR Reporting System in Terms of Usefulness, Ease of Use, and Satisfaction

	Control			**Intervention**		
	Mean	**Sd**	**Description**	**Mean**	**Sd**	**Description**
It helps me be more effective.	4.00	0.75	Agree	4.80	0.42	Strongly Agree
It helps me be more productive.	4.12	0.84	Agree	4.30	0.68	Strongly Agree
It is useful.	4.38	0.52	Strongly Agree	4.70	0.48	Strongly Agree

It makes the things I want to accomplish easier to get done	4.00	0.92	Agree	4.60	0.69	Strongly Agree
It saves me time when I use it.	4.00	0.92	Agree	4.40	1.08	Strongly Agree
Total Usefulness	**4.10**	**0.75**	**High**	**4.56**	**0.52**	**Very High**
It is easy to use	4.38	0.74	Strongly Agree	4.90	0.32	Strongly Agree
It is user-friendly	4.50	0.54	Strongly Agree	4.80	0.63	Strongly Agree
It requires the fewest steps possible to accomplish what I want to do with it	4.38	0.52	Strongly Agree	4.90	0.32	Strongly Agree
Both occasional and regular users would like it.	4.23	0.84	Strongly Agree	4.60	0.70	Strongly Agree
I can recover from mistakes quickly and easily.	3.88	0.84	Agree	4.60	0.70	Strongly Agree
Total Ease of Use	**4.25**	**0.56**	**Very High**	**4.76**	**0.34**	**Very High**
I am satisfied with it.	3.88	0.84	Agree	4.80	0.42	Strongly Agree
I would recommend it to a friend.	4.13	0.84	Agree	4.60	0.70	Strongly Agree
It is pleasant to use.	4.13	0.84	Agree	4.80	0.42	Strongly Agree
It works the way I want it to work.	3.75	0.89	Agree	4.70	0.48	Strongly Agree
I feel like I need to have it.	3.63	0.74	Agree	4.40	0.69	Strongly Agree
Total Satisfaction	**3.90**	**0.72**	**High**	**4.66**	**0.42**	**Very High**
Overall Level of Effectiveness	**4.08**	**0.56**	**Effective**	**4.66**	**0.34**	**Very Effective**

1.00-1.80 Strongly Disagree/Very Low; 1.81-2.60 Disagree/Low; 2.61-3.40 Neutral/ Moderate; 3.41-4.20 Agree/Effective; 4.21-5.00 Strongly Agree/Very High

For the control group, the overall usefulness was rated high with a mean score of 4.10 and a standard deviation (SD) of 0.75. The participants generally agreed that the system helped them be more effective (Mean = 4.00, SD = 0.75), productive (Mean = 4.12, SD = 0.84), and found it useful (Mean = 4.38, SD = 0.52). It also made tasks easier (Mean = 4.00, SD = 0.92) and saved time (Mean = 4.00, SD = 0.92). In comparison, the intervention group rated the system as very high in usefulness with a mean score of 4.56 and an SD of 0.52. They strongly agreed that the system improved their effectiveness (Mean = 4.80, SD = 0.42), productivity (Mean = 4.30, SD = 0.68), and usefulness (Mean = 4.70, SD = 0.48). It also made tasks easier (Mean = 4.60, SD = 0.69) and saved time (Mean = 4.40, SD = 1.08).

Furthermore, the control group rated the ease of use very high with a mean score of 4.25 and an SD of 0.56. They strongly agreed that the system was easy to use (Mean = 4.38, SD = 0.74), user-friendly (Mean = 4.50, SD = 0.54), required few steps (Mean = 4.38, SD = 0.52), and was liked by both occasional and regular users (Mean = 4.23, SD = 0.84). They also felt they could recover from mistakes easily (Mean = 3.88, SD = 0.84). The intervention group rated the ease of use even higher with a mean score of 4.76 and an SD of 0.34. They strongly agreed on all aspects, finding the system easy to use (Mean = 4.90, SD = 0.32), user-friendly (Mean = 4.80, SD = 0.63), requiring few steps (Mean = 4.90, SD = 0.32), and suitable for all users (Mean = 4.60, SD = 0.70). They also found it easy to recover from mistakes (Mean = 4.60, SD = 0.70).

Additionally, the level of satisfaction with the system in the control group was high, with a mean score of 3.90 and an SD of 0.72. Participants agreed that they were satisfied with the system (Mean = 3.88, SD = 0.84), would recommend it to a friend (Mean = 4.13, SD = 0.84), found it pleasant to use (Mean = 4.13, SD = 0.84), and felt it worked as desired (Mean = 3.75, SD = 0.89). They also felt a need for it (Mean = 3.63, SD = 0.74). In contrast, the intervention group showed very high satisfaction with a mean score of 4.66 and an SD of 0.42. They strongly agreed on all satisfaction measures, including overall satisfaction (Mean = 4.80, SD = 0.42), recommending it to friends (Mean = 4.60, SD = 0.70), finding it pleasant (Mean = 4.80, SD = 0.42), and working as desired (Mean = 4.70, SD = 0.48). They also felt a strong need for it (Mean = 4.40, SD = 0.69).

The collected data revealed the evaluation results from participants in both the control and intervention groups regarding the RESETA reporting system. Combining all aspects, the control group found the ADR reporting system to be effective with an overall mean score of 4.08 and an SD of 0.56. The intervention group rated the system as very effective with an overall mean score of 4.66 and an SD of 0.34. The results indicated a significant improvement in perceived effectiveness in terms of usefulness, ease of use, and satisfaction with the intervention. In line with this, the study by Li et al. (2019) concluded that developments in digital technology over the past decade have led to the increased adoption of electronic reporting tools aimed at enhancing adverse drug reaction (ADR) reporting. These electronic tools have become a more common interventional strategy for improving ADR reporting, demonstrating a substantial increase in effectiveness compared to traditional methods [81]. Additionally, Sandberg et al. (2022) mention that lack of time is one of the main reasons why physicians did not report suspected ADRs, a hindrance that could be addressed by an electronic reporting tool like RESETA, as reflected in the data above [82].

3.5 Test of Difference in the Level of Effectiveness of the ADR Reporting System in Terms of Usefulness, Ease of Use, and Satisfaction

This part analyzes the difference between the effectiveness of the ADR reporting system of the intervention and control group in terms of usefulness, ease of use, and level of satisfaction. Tests used are the mean, t-test independent sample, and p-value which are appropriate to properly analyze and interpret the given data presented below.

Table 8 - Test of Difference in the Level of Effectiveness of the ADR Reporting System in Terms of Usefulness, Ease of Use, and Satisfaction

		Mean	t-value	p-value	Remarks
Usefulness	**Control Group**	4.100	-1.535	0.144	**Not Significant**
	Intervention Group	4.560			
Ease of Use	**Control Group**	4.250	-2.388	0.030	**Significant**
	Intervention Group	4.760			
Satisfaction	**Control Group**	3.900	-2.809	0.013	**Significant**
	Intervention Group	4.660			
Over-all	**Control Group**	4.083	-2.706	0.016	**Significant**
	Intervention Group	4.660			

P-value < 0.05 = Significant ; P-value > 0.05 = Not Significant

Table 8 shows the result of the Test of Difference in the Level of Effectiveness of the ADR Reporting System in Terms of Usefulness, Ease of Use, and Satisfaction. Data shows that in terms of usefulness, the difference is not statistically considered significant. Meaning, the respondents perceived the usefulness equal between those in the control and those who used the intervention developed. As per the establishment of the FDAs Pharmacovigilance system in the Philippines, the FDA has remained steadfast in making numerous ways to report ADRs. In fact, it is found in the FDAs website the various ADR reporting forms that can be downloaded and printed. But then again, many people do not know an existing reporting system as seen by the data presented and from the study by Garcia-Abeijon et al. (2023) discussing that the results of the lack of information of an existing ADR reporting system may be due to lack of feedback from the national regulatory authorities and lack of training [65].

However, data shows significant differences in the level of ease of use where those respondents who used the intervention find it highly easier to navigate and use the platform than using the conventional one (t=-2.388; p=0.030). The same trend was seen for satisfaction; those respondents who used the intervention rated it as highly satisfied than those using the conventional one (t=-2.809; p=0.013). In terms of the overall level of effectiveness, the difference is still statistically significant (t=-2.706; p=0.016); those respondents who used the intervention found it more effective than those using the conventional one.

The usage of online platform is evident in increasing ease of use, usefulness, and satisfaction especially in making it another option aside from the standard pen and paper because a study by Alharbi F. (2021) in which the researcher studied the use of digital healthcare platforms during the COVID-19 pandemic among consumers discusses that use of digital healthcare platforms during and after COVID-19 exhibited strong intention of usage amongst consumers [83]. The strong intention of usage of digital platforms is then backed by a study by Fukushima A. et al. (2022) in relation to reporting ADRs wherein the results shows positive experiences in reporting ADRs using mobile application or digital platforms [84] as well as from a study by de Vries, S.T. et al. (2017) wherein the study asserted that recent technological developments may increase ADR reporting and improve the communication of new safety issues [85]. Therefore, the RESETA initiative could be a way to increase the prevalence of ADR reporting in a tertiary hospital of Davao City with perceived significant satisfaction, usefulness, and ease of use amongst healthcare providers such as nurses, pharmacists, and doctors.

3.6 Effect Size of the NFC Tags in Terms of Usefulness, Ease of Use, and Satisfaction

This part analyzes the difference between the effectiveness of the ADR reporting system of the intervention and control group in terms of usefulness, ease of use, and level of satisfaction. Tests used are the mean, t-test independent sample, p-value, and Cohen's D which is appropriate to properly analyze and interpret the given data presented below.

Table 9 - Effect Size of the Intervention

		Mean	t-value	p-value	Cohen's D	Remarks
Usefulness	**Control Group**	4.100	-1.535	0.144	0.508	**Medium**
	Intervention Group	4.560				
Ease of Use	**Control Group**	4.250	-2.388	0.030	0.552	**Medium**
	Intervention Group	4.760				
Satisfaction	**Control Group**	3.900	-2.809	0.013	0.580	**Medium**
	Intervention Group	4.660				
Over-all	**Control Group**	4.083	-2.706	0.016	0.573	**Medium**
	Intervention Group	4.660				

P-value < 0.05 = Significant ; P-value > 0.05 = Not Significant ; Cohen Ds 0.2 = small effect ; Cohen Ds 0.5 = moderate effect ; Cohen Ds 0.8 = large effect

Table 9 presents a comparative analysis of the control group and intervention group across three dimensions: Usefulness, Ease of Use, and Satisfaction. The results indicate that the intervention had a medium or moderate effect across all these dimensions.

For Usefulness, the control group had a mean score of 4.100, while the intervention group had 4.560. The t-value of -1.535 and p-value of 0.144 indicate that this difference is not statistically significant. However, Cohen's D value of 0.508 suggests a medium effect size. This shows that the intervention had a moderate impact on how useful participants found the intervention. For Ease of Use, the control group's mean score was 4.250 compared to the intervention group's 4.760. This difference is statistically significant, with a t-value of -2.388 and a p-value of 0.030. The Cohen's D value is 0.552, indicating a medium effect size. This shows that the intervention had a moderate overall impact on participants. Satisfaction scores were 3.900 for the control group and 4.660 for the intervention group. The t-value of -2.809 and p-value of 0.013 reflect a statistically significant difference. Cohen's D of 0.580 shows a medium effects size, implying that the intervention moderately enhanced participants' satisfaction.

Overall, the control group scored 4.083, whereas the intervention group scored 4.660. This difference was statistically significant (t=-2.706;p=0.016). Cohen's D value of 0.573 shows a medium effect size, indicating that the intervention had a moderate overall impact on participants. The values of Cohen's D across all dimensions range from 0.508 to 0.580. According to Aarts et al. (2013), standard interpretations of Cohen's D, where 0.2 represents a small effect size, 0.5 a medium effect size, and 0.8 a large effect size, these results consistently indicate a medium effect size. Moreover, this demonstrates that the intervention had a moderate and significant impact on participants' evaluations of utility, ease of use, satisfaction, and overall evaluation [86]. Thus, our study showed moderate variances in usefulness, ease of use, and satisfaction among participants in using the NFC tag, which are consistent with the improved usability measures provided in the study by MacDorman et.al (2011). This emphasizes the importance of improving NFC technology implementations to improve user experience, as defined by the usability metrics stated in the literature [87].

4. CONCLUSION & RECOMMENDATIONS

4.1 Conclusion

The study aimed to evaluate the impact of an innovative Near Field Communication (NFC) tag-based reporting system, RESETA, on adverse drug reaction (ADR) reporting behaviors among healthcare professionals in a tertiary hospital of Davao City by determining whether the NFC tag implementation significantly improves the level of knowledge, awareness, and prevalence of ADR reporting among physicians, pharmacists, and nurses compared to traditional reporting methods. The findings suggest that there was a lack of significant increase in prevalence, awareness, and knowledge of ADR reporting using NFC tags. Despite a lack of significant increases in the prevalence of ADR reports within the one-month period, it is essential to consider several factors that may have influenced this outcome. Some of the reasons include that a medication might have a strong safety profile,

characterized by a low incidence of side effects. Additionally, time constraints, complexity of the reporting system, and uncertainty about causality might hinder reporting. Furthermore, the duration of the study may not be sufficient to capture rare or delayed-onset ADRs. Therefore, the low prevalence of reported cases of ADRs is not directly related to the effectiveness of the RESETA intervention but may provide a mode of communication between the regulatory bodies and the ADRs. However, the findings indicate a significant improvement in perceived ease of use, usefulness, and satisfaction among healthcare professionals using the NFC tag-based system. Participants strongly agreed that the NFC system could lead to a higher frequency of reports due to its enhanced usability. Specifically, the groups rated the system's usefulness, ease of use, and satisfaction significantly high, with medium effect sizes indicating a moderate impact across all dimensions. Moreover, the data revealed substantial awareness among healthcare workers about the benefits of ADR reporting, though there were noted challenges, such as the complexity of the reporting system and inadequate training. The improved scores in the intervention group suggest that the NFC system effectively addresses these barriers, making the process more streamlined and accessible. Theoretically, this study contributes to the understanding of technological interventions in influencing healthcare professionals' behavior, particularly in pharmacovigilance. For research, it paves the way for further exploration into NFC and other emerging technologies to enhance data reporting and patient safety. Practically, the findings suggest an adoptable intervention in various healthcare settings such as tertiary hospitals which leads to a more efficient Pharmacovigilant process for future drug research.

4.2 Recommendation

Based on the findings and conclusion, the researchers hereby present the following recommendations:

1. **Future researchers:** For future researchers delving into the integration of adverse drug reaction (ADR) reporting systems using Near Field Communication (NFC) technology, it is crucial to build upon the findings of the RESETA study by expanding the scope of research to multiple tertiary hospitals across different regions. This would provide a broader understanding of the system's efficacy and adaptability in diverse healthcare settings. Additionally, incorporating qualitative methods such as in-depth interviews with healthcare professionals can yield insights into the user experience and potential barriers to adoption that quantitative data alone may not reveal. Future studies should also consider long-term evaluations to assess the sustainability and impact of the NFC technology on ADR reporting rates over extended periods.
2. **Students:** For students interested in exploring the intersection of technology and healthcare, the RESETA project serves as an excellent example of innovative solutions addressing critical issues in pharmacovigilance. Students should focus on gaining a robust understanding of both the technological aspects of NFC and the clinical implications of ADRs. Engaging in multidisciplinary studies that combine pharmacy, information technology, and healthcare management will provide a comprehensive skill set. Practical experience through internships or project collaborations with healthcare institutions implementing such technologies can also be invaluable. Furthermore, students should stay updated with the latest advancements in digital health technologies and their applications in improving patient safety and reporting systems.
3. **Professionals:** Healthcare professionals, particularly those involved in pharmacovigilance and hospital administration, should consider the potential of integrating NFC technology into their ADR reporting processes as demonstrated by the RESETA project. Training programs tailored for healthcare workers on the use of NFC tags and the importance of ADR reporting can significantly enhance compliance and accuracy. Professionals should advocate for institutional support to implement and maintain such systems, emphasizing the long-term benefits of improved patient safety and streamlined reporting mechanisms. Collaboration with technology providers to customize NFC solutions that meet the specific needs of their institutions can further optimize the effectiveness of this approach. Lastly, fostering a culture of continuous improvement and openness to adopting new technologies will be essential for the successful integration of such innovations.

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