

**An Authenticated Patient Information Transaction for Telemedicine  
Application**

**By**

**Rajuana Khanam**

**ID: 191-17-394**

This Report Presented in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Management Information System.

Supervised By

MD. Zahid Hasan

Assistant Professor

Department of CSE

Faculty of Science and Information Technology

DaffodilInternationalUniversity



**DAFFODIL INTERNATIONAL UNIVERSITY**

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## APPROVAL

This thesis titled “**An Authenticated Patient Information Transaction for Telemedicine Application**”, Submitted by Rajuana Khanam, ID No: 191-17-394 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of MS in Management Information System and approved as to its style and contents. The presentation has been held on 08 December 2019.

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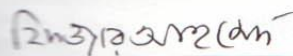
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## DECLARATION

I hereby declare that, this thesis has been done by me under the supervision of **MD. Zahid Hasan, Assistant Professor, Department of Computer Science and Engineering**, Daffodil International University. I also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for award of any degree or diploma.

Supervised by:



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MD. Zahid Hasan  
Assistant Professor  
Department of CSE  
Daffodil International University

Submitted by:



---

Rajuana Khanam  
ID: 191-17-394  
Department of MIS  
Daffodil International University

## **ABSTRACT**

Telemedicine is the demeanor of patient's actuality transaction from one site to another via electronic communications to ameliorate patients' health status. It utilizes the faraway settlement of healthcare services such as health metering, interlocution, etc. over the telecommunications infrastructure. In this technology is frequently used for a host of other clinical services that can be provided remotely via secure video and audio connections or image transaction. As with any technology that involves electronically transmitting patient actuality, telemedicine systems are doughty to hackers and dissolution. Human services associations stay perhaps the greatest objective for online law breakers and fear based oppressors, thus validation process is required. This approach proposed a solution which uses One time pad based on symmetric cipher model. Here, sender has a secret key (code) that it can use to encrypt a packet of information and generate cipher text and send receiver side though a secure network , receiver receive encrypted information and decode the information with the same key of sender and get information. Receiver has a key ring for communicate more parties at a time. To provide better security for information transaction.

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## TABLE OF CONTENTS

<b>CONTENTS</b>	<b>PAGE</b>
Board of examiners	i
Declaration	ii
Acknowledgements	iii
Abstract	iv
<b>CHAPTER 1: INTRODUCTION</b>	<b>1-3</b>
1.1 Introduction	1
1.2 Motivation	2
1.3 Objectives	2
1.4 Expected Outcome	2
1.5 Report Layout	3
<b>CHAPTER 2: Literature Review</b>	<b>4-7</b>
2.1 Introduction	4
2.2 Related Works	4-5
2.3 Comparative Studies	6
2.4 Benefits	6
2.5 Limitation	6
2.6 Scope of the Problem	6-7
2.7 Challenges	7

<b>CHAPTER 3: Proposed Methodology</b>	<b>8-17</b>
3.1 Introduction	8
3.2 Flow Diagram	8-10
3.3 Work Process	11
3.4 Data Acquisition	12-14
3.5 Algorithm	15
3.6 Implementation	16-17
<b>CHAPTER 4: Result and Discussion</b>	<b>18</b>
4.1 Result	18
<b>CHAPTER 5: CONCLUSION AND FUTURE WORK</b>	<b>19</b>
5.1 Conclusion	19
5.2 Future work	19
<b>REFERENCES</b>	<b>20</b>

## LIST OF FIGURES

<b>FIGURES</b>	<b>PAGE</b>
Figure 3.2.1Encryption process	8
Figure 3.2.2Sender send file to receiver	9
Figure 3.2.3Decryption process	10
Figure 3.3.1Process of work	11
Figure 3.4.1Patient Report	12
Figure 3.4.2Patient prescription	13
Figure 3.5.1Process of one time pad algorithm	15
Figure 3.6.1Key generation	16
Figure 3.6.2Input message for encryption	16
Figure 3.6.3Output of decryption message	17



## LIST OF TABLES

<b>TABLES</b>	<b>PAGE</b>
Table 3.4.3.1 Patient information	14

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

The possibility of telemedicine isn't new thing. Therapeutic data has been transmitted between distant parties for quite a while. "Telemedicine" was originated in 1965-1970. The Greek prefix "tele" or "telo" or "tel" signifies "far off," especially "transmission over a distance".[9]Telemedicine is the remote conveyance of social insurance administrations, for example, well being appraisals or interviews, over the broadcast communications foundation. Remote patient checking otherwise called tele observing [6] .It enables social insurance suppliers to evaluate, analyze and treat patients through electronic interchanges, for example, email, two-way video, remote devices, conferencing and advanced cells, without the requirement for an in-person visit. Remote guardians can audit the information right away. [6][7]Remote parental figures can survey the information instantly. Examples of telemedicine incorporate gathering treatment, nursing co operations, instruction and preparing, tele visits to network wellbeing laborers, and restorative picture transmission. This likewise incorporates tele interviews, for example, tele radiology, tele dermatology, tele nervous system science and tele drug store. For executing data the verification is required for security. The data of client is delicate any unapproved individual can do changes in it, to hurt the information. So the primary worry of validation is to give the security of information or records. To ensure information of client, encryption is utilized to verify information in this framework. In this examination paper a definitive target is to advance an incorporated system/answer for accomplishing the information security in different potential conditions, so this innovation might be executed in uses of adaptable nature with no imperfection.

## **1.2 Motivation**

In a developing total populace by old and new ailments, rising desires for wellbeing, and financial conditions that have, on the off chance that anything, expanded incongruities in wellbeing status between and inside nations. Generally, some portion of the trouble in accomplishing evenhanded access to medicinal services has been that the supplier and the beneficiary must be available in a similar spot and simultaneously. Late advances in data and correspondence advances, be that as it may, have made uncommon open doors for conquering this by expanding the quantity of ways that medicinal services can be conveyed. As we know everything has an error. In these technologies, sometimes the information patients can be changed or hacked. For preventing these uncertain issues the system has been proposed. Because medical problem must need profoundly reimbursement.

## **1.3 Objectives**

For transacting information the authentication is needed for security. The data of client is very sensitive any unapproved individual can do changes in it, to hurt the information. So the primary worry of validation is to give the security of information or documents. To ensure information of client, encryption is utilized to verify information in this framework.

## **1.4 Expected Outcome**

This approach proposed a solution which uses Onetime pad based on symmetric cipher model. Here, sender has a secret key (code) that it can use to encrypt a packet of information and generate cipher text and send receiver side though a secure network , receiver receive encrypted information and decode the information with the same key of sender and get information. Receiver has a key ring for communicate more parties at a time. To provide better security for information transaction.

## **1.5 Report Layout**

The layout of this report is described below:

In chapter 1 I have covered the introduction to my system, motivation for building this kind of system, objectives and goals of the An Authenticated Patient Information Transaction for Telemedicine Application, what I have planned or the expected outcome of the application and the ultimate layout of this report.

In chapter 2 I have added some related papers and some case studies that helped me a lot in developing this application system. I also included the problems and challenges that I faced during the research development phase.

In chapter 3 I have specified the whole process of this application using some diagrams, work flow diagrams, implementation.

In chapter 4 I included result of the system.

In chapter 5 is covered by the discussion and future development scopes and plans.

# CHAPTER 2

## Literature Review

### 2.1 Introduction

In our country basically rural area have lack of Expert Doctor. For better treatment rural area doctor have to consult other doctor's though telemedicine. To improve patient quality of care share report/information between two or more doctors. A critical requirement in patient records is to authenticate the different parts of the troublesome patient information should increased security and privacy risks. In this propose system if we can provide more secure in telemedicine transaction process and proper authentication it will a great success for medical health sector. For authentication here use symmetric encryption/decryption process.

### 2.2 Related Works

I have checked and tried to understand some Authentication process in Telemedicine System. Some of them are listed below:

a) Dayana P. B. Spagnuolo, Jean E. Martina, Ricardo F. proposedan confirmation administration for telemedicine innovations dependent on web administrations. This administration utilizes adaptable confirmation strategies dependent on two-factor validation components. This paper proposes another verification model that utilizations particular and adaptable strategies with a two-factor authenticationas a safe web administration. In this paper principle qualities are: adaptability of arrangement for the verification instruments, just as the utilization of a vigorous framework for recording occasions. Designer are manage security framework and the subtleties of its usage. What's more, they likewise attempt to examine the viability and usability of various confirmation strategies.[3]

b) Vaibhav Garg, M.S., and Jeffrey Brewer, M.S. proposed in telemedicine based innovation option in contrast to conventional human services conveyance. Be that as it may, poor safety efforts in telemedicine administrations can adversely affect the nature of care given, paying little mind to the ceaseless condition being contemplated. We attempted a deliberate audit of 58 diary articles relating to telemedicine security. These articles were chosen dependent on a watchword search on 14 applicable diaries. The articles were coded to assess the procedure and to recognize the key zones of research in security that are being checked on. Seventy-six percent of the articles characterized the security issue they were tending to, and just 47% detailed an exploration question worried to security. Sixty-one percent proposed an answer, and 20% of these tried the security arrangements that they proposed. Earlier research demonstrates lacking announcing of technique in telemedicine look into. They saw that as valid for security inquire about also. We likewise recognized different issues, for example, utilizing obsolete security benchmarks.[1]

c) Omid Mir, Morteza Nikooghadam healthcares administrations use tele care prescription data frameworks (TMIS). In TMIS, a patient can get sorts of social insurance conveyance administrations. Besides, medico and furthermore parental figures can check indispensable indications of patients remotely. Patient's security is ensured by utilizing a legitimate validation and encryption system. As of late, numerous client verification plans have been proposed that are appropriate to TMIS. Be that as it may, security of most proposed plans is powerless. Recently, Yan et al. proposed an effective biometrics-based verification scheme for TMIS. In this paper, by an elucidation of some dynamic assaults, it is demonstrated that Yan et al's. scheme has still some security imperfections. Afterward, an improved biometrics-based validation and key understanding plan is proposed. The Security of the proposed verification and key understanding scheme is demonstrated in the irregular prophet model. Besides, we utilize the BAN rationale to demonstrate the rightness of the proposed plan. What's more, we mimic our plan for the formal security examination utilizing the Automated Validation of Internet Security Protocols and Application tool. It is demonstrated that because of better security and furthermore productivity in computational time, the proposed scheme is increasingly reasonable for work in TMIS.[2]

## **2.3 Comparative Studies**

After reviewing some other similar approaches and their case studies I have sorted common features and unique features of each. Most of them are built for specific purpose for their own demand.

## **2.4 Benefits**

- Telemedicine offers keen answers for improving the wellbeing and strength of individuals.[4]
- The most potential traits of telemedicine incorporates its far reaching access of care, comfort, and decrease in therapeutic spending.
- The impacts of telemedicine are soothing this onus for patients, restorative staff, and government medicinal financing programs. One factor ascribing to bring down cost is the disposal of movement.
- Doctors never again are required to go for CMEs patients don't need to venture out far separations to get therapeutic consideration or particular.[4]
- Many remedial offices are using telemedicine for the simple reality that it decreases therapeutic travel expenses.[4]

## **2.5 Limitations**

- Have some technical limitations such as the implementation language.
- Have some ethical or legal issues.
- Must need better internet collection.

## **2.6 Scope of the Problem**

Patient's therapeutic records contain touchy data which ought not be caused fit to unapproved people so as to ensure persistent security, respectability and confidentiality [11]. Simultaneously understanding data ought to be promptly accessible at whatever point required by endorsed clients for bona fide reason patients medicinal. Digital assaults on patient's therapeutic records or reports and wellbeing data can prompt extreme outcomes like patient character revelation, shame, protection infringement and in the most exceedingly terrible case. For the expansion in the security needs all the more breaking down.

## **2.7 Challenges**

### **a) Security and fraud concerns**

In a location where no one can overhear the virtual visits, which would violate privacy, confidentiality requirements. Patient's medical records contain very sensitive information which should not be tele health devices may collect and transmit information on activities like substance abuse .For information protection against unauthorized access and modification, authentication of the sender and secret data containers for additional data.

### **b) Keys Generate**

There is a hazard that clients won't have any desire to enact the cryptography, which at that point bargains security. Key administration ought to be easy to such an extent that clients are not in any case mindful of it: Encryption ought to be programmed. There ought to be no real way to turn it off. Along these lines, in the event that there is no uncertain mode, at that point there is no way of somebody unintentionally sending decoded, defenseless information .

### **c) Data collection:**

Patients data collection is also a challenging, any patient can't gives his/her medical information.



# CHAPTER 3

## Proposed Methodology

### 3.1 Introduction

In this chapter describe the graphically representation.

### 3.2 Flow Diagram

Figure 3.2.1 show patient file though sender private key, after encryption generate cipher.

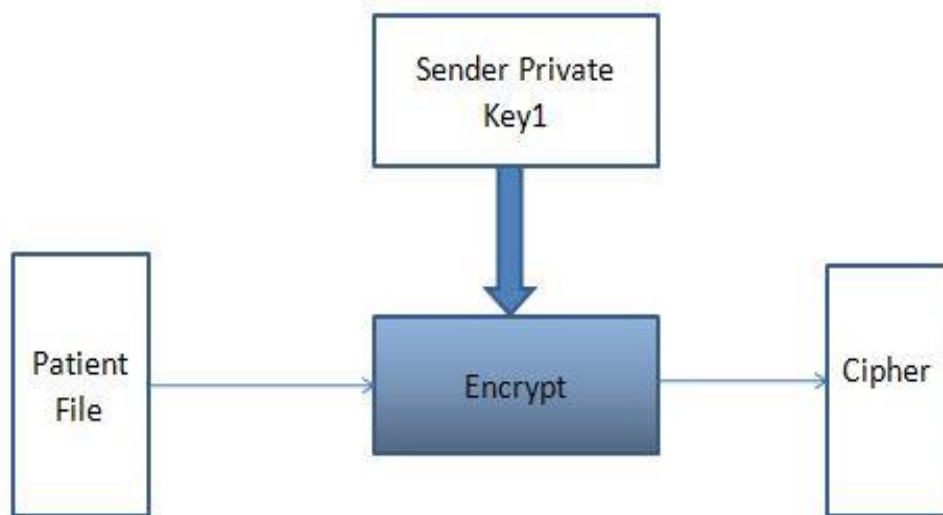


Figure: 3.2.1 Encryption process

Figure 3.2.2 show patient file though sender private key, after encryption generate cipher and sent file to receiver.

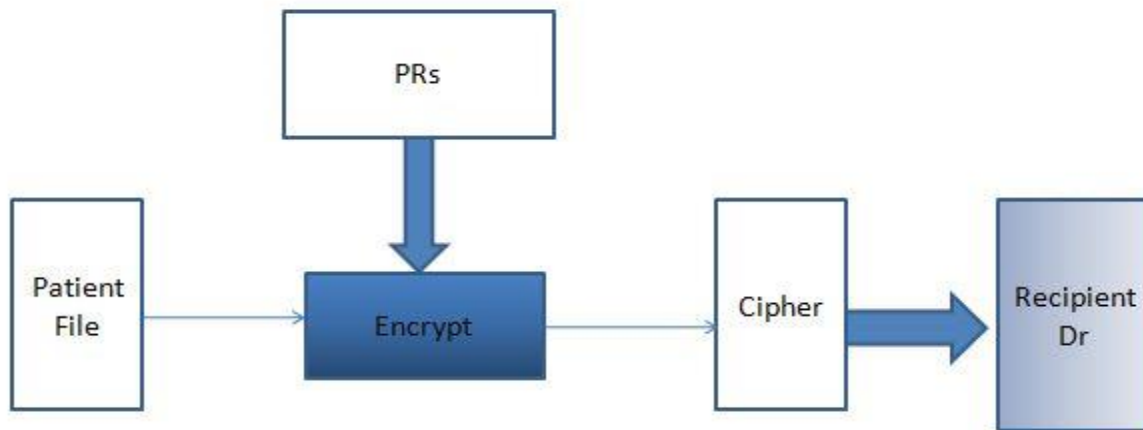


Figure: 3.2.2 Sender Send File to Receiver

Figure 3.2.3 show receiver receive a cipher from sender, decrypt File with receiver private key and get a Patient File/Report.

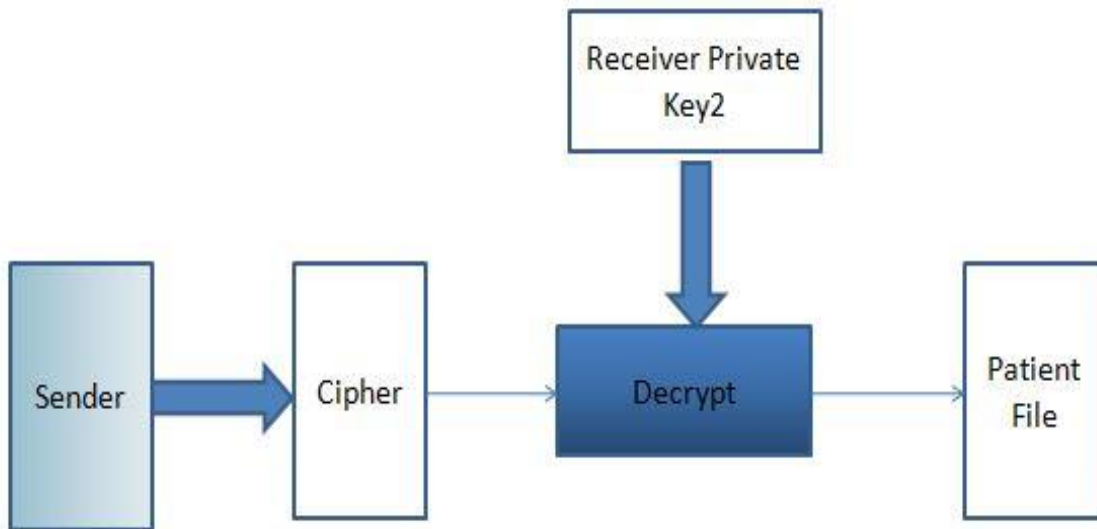


Figure: 3.2.3 Decryption process

### 3.3 Work process

#### Encryption:

Sender does the following:

1. Take a Patient File/Report
2. Encrypt File with Sender's private key ,PRs
3. Generate a cipher
4. Send to Receiver

#### Decryption:

Receiver does the following:

1. Receive a cipher from sender
2. Decrypt File with Receiver's private key ,PRr
3. Get a Patient File/Report

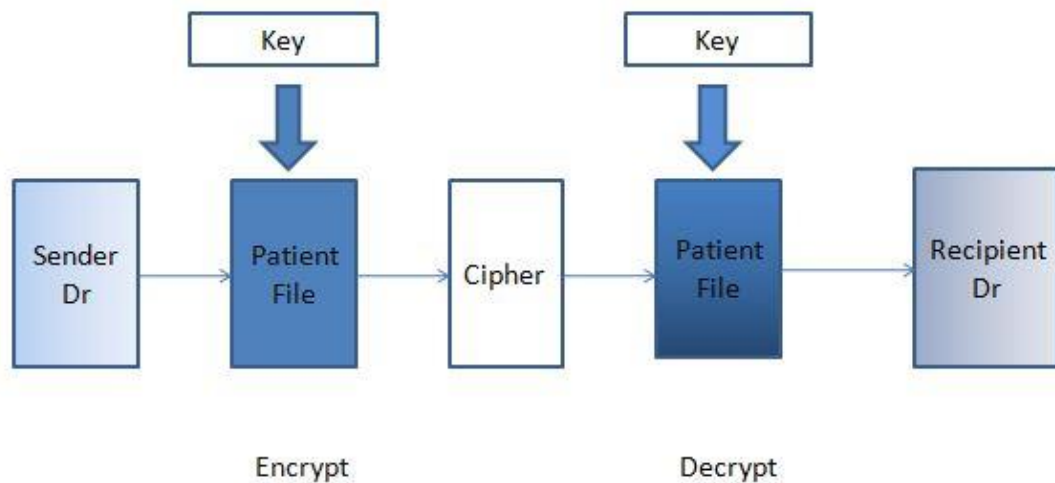


Figure: 3.3.1 Process of working

### 3.4 Data Acquisition

We (I) go X Medical College & Hospital and collect some information from indoor and outdoor patient.

#### 3.4.1 Reports:

Figure 3.4.1 show report of a Dengue patient.

**Case Report of Dengue Patients**

<b>Particulars of the Patient:</b>		ID:	
Name: Masuma Akter		Admitted on: 12/8/19	
Age: 22 years		Blood Group: Rh+ve	
Sex: Female		NS1Ag (+) ve on 12/8/19 IgM	IgG
Weight: 47 kg			

<b>Clinical manifestations:</b>			
Fever for 3 days	Start Date	Pattern: Intermittent	Afebrile for _____ days
Admitted on 3 day	Day of Fever	H.Temp 101°F	
Headache ✓	Body ache ✓	Retro orbital pain ✓	for _____ Days
Diarrhoea for _____ days		vomiting for 1 days 2 episode	
Rash for _____ days	Bleeding Manifestations:		
Others:			
Co-morbidity: HTN for _____	Drug:	DM for _____	Drug:

<b>Follow up:</b>							
	12/08/19	12/08/19	19				
	Admission	Morning	Evening	Morning	Evening	Morning	Evening
BP	100/60	100/70	100/70	100/60			
Pulse	108	69	68/70	86/min			
R/R	18/min	18	16/min	18/min			
Temp	98°F	99	98°F	98°F			
Dehydration	(-)	-	-	(-)			
Rash	(-)	-	-	(-)			
Oedema	(-)	-	-	(-)			
Lungs	clear	clear	clear	clear			
Abdomen	soft	soft	soft	soft			
U. output	voided	voided	voided	voided			

<b>Investigations:</b>							
		Date 12/8/19		Date		Date	
CBC	Admission	Morning	Evening	Morning	Evening	Morning	Evening
Hb%	11.5	11.7	12.2				
WBC	3370	2460	3460				
Platelet	322000	2,08,000	3,11,000				
HCT/PCV	35.0%	36.5	36.2				
SGPT		14					
SGOT		23					
NS1Ag	(+)		(-)				
IgM							
IgG							
Others							

Figure: 3.4.1 Patient report

### 3.4.2 Patient prescription:

Figure 3.4.1 show prescription of a patient.

W3 Pathway Nagar, Thane Road, Navroze, Dhule  
Phone: 214279445, 01716358166

**Outpatient Ticket**

Ticket No: 18729/2019  
Dept: Maxillofacial & Dental Surgery  
Patient Id: 4021182017

Patient Name: TEETHY SUTRADHAR  
Address: EM-14, EMCIL  
Phone: 91523579729  
Age: 21Y 9M 9D  
Sex: Female

Date & Time: 02-Sep-19 10:57:10 AM  
Ticket Type: Second  
Consultant: Asst. Prof. Dr. Anil Kumar  
- Paras  
BDS, MCh, FRCR  
Time: 08:00 AM To 07:30 PM  
C.F.: 30.00

R.

O/E.

- Paracetamol 500mg  
2-3 times
- Tab. Rdu 10mg  
2-3 times (with food)
- Cap. Sengal 20mg  
2-3 times (with food)

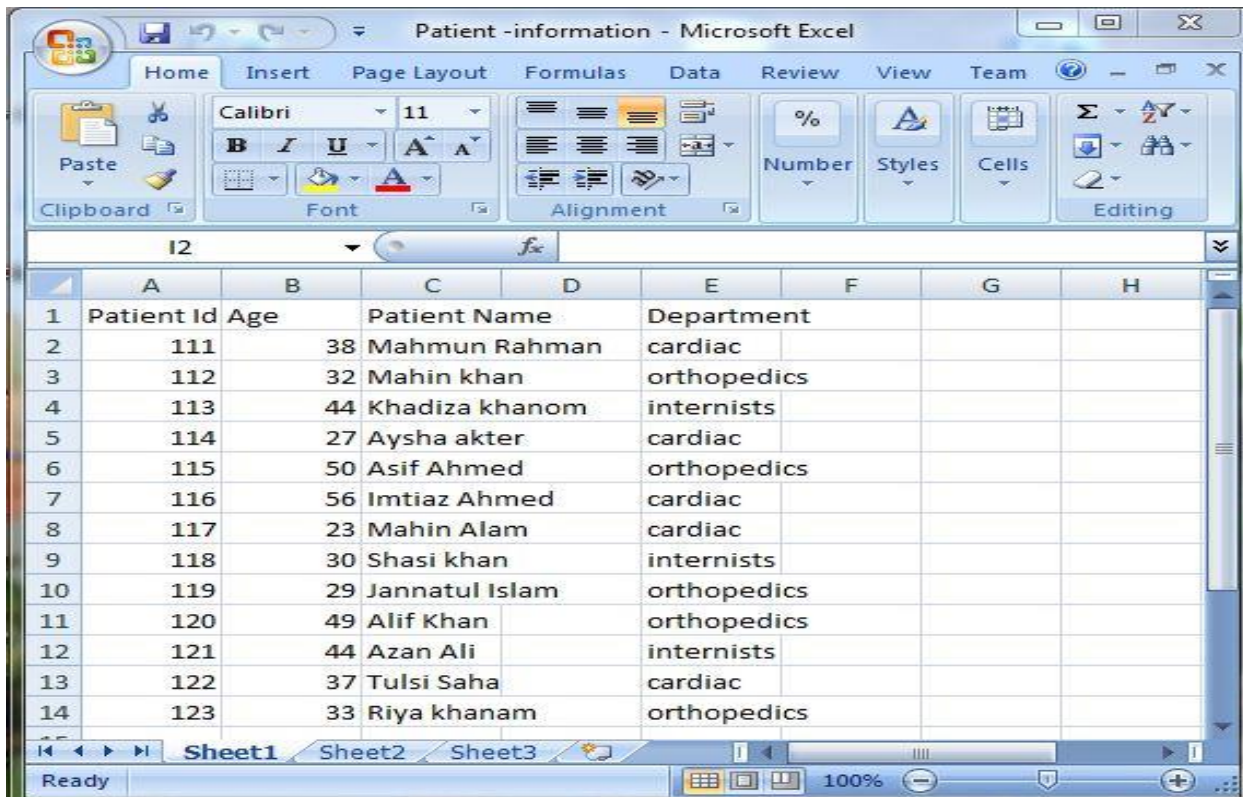
Advice:  
X-ray OPG

Figure: 3.4.2 Patient prescription

### 3.4.3 Patient Information:

Figure: 3.4.3.1 Show all diagnosis Information what is for a patient diagnosis test for the interlocation.

Table: 3.4.3.1 Patient information



The screenshot shows a Microsoft Excel spreadsheet titled "Patient -information - Microsoft Excel". The spreadsheet contains a table with 14 rows of patient data. The columns are labeled A through H, with the following headers: A: Patient Id, B: Age, C: Patient Name, D: Department, E: (blank), F: (blank), G: (blank), H: (blank). The data rows are numbered 1 through 14 in the first column.

	A	B	C	D	E	F	G	H
1	Patient Id	Age	Patient Name	Department				
2	111	38	Mahmun Rahman	cardiac				
3	112	32	Mahin khan	orthopedics				
4	113	44	Khadiza khanom	internists				
5	114	27	Aysha akter	cardiac				
6	115	50	Asif Ahmed	orthopedics				
7	116	56	Imtiaz Ahmed	cardiac				
8	117	23	Mahin Alam	cardiac				
9	118	30	Shasi khan	internists				
10	119	29	Jannatul Islam	orthopedics				
11	120	49	Alif Khan	orthopedics				
12	121	44	Azan Ali	internists				
13	122	37	Tulsi Saha	cardiac				
14	123	33	Riya khanam	orthopedics				

### 3.5 Algorithm: One pad time

- To encrypt plain content information the sender utilizes a key string equivalent long to the plain content.
- The key is utilized by immixture (XOR) ing bit by bit, always a bit of the key with a bit of the plain text to create a bit of cipher text.
- This cipher text is then sent to the recipient.
- At the recipient's end, the encoded message is mixed (XOR) ed with the duplicate copy of the One Time Key and the plain text is restored.
- Both sender's and beneficiary's keys are consequently obliterated after use, to guarantee re-utilization of a similar key is preposterous.

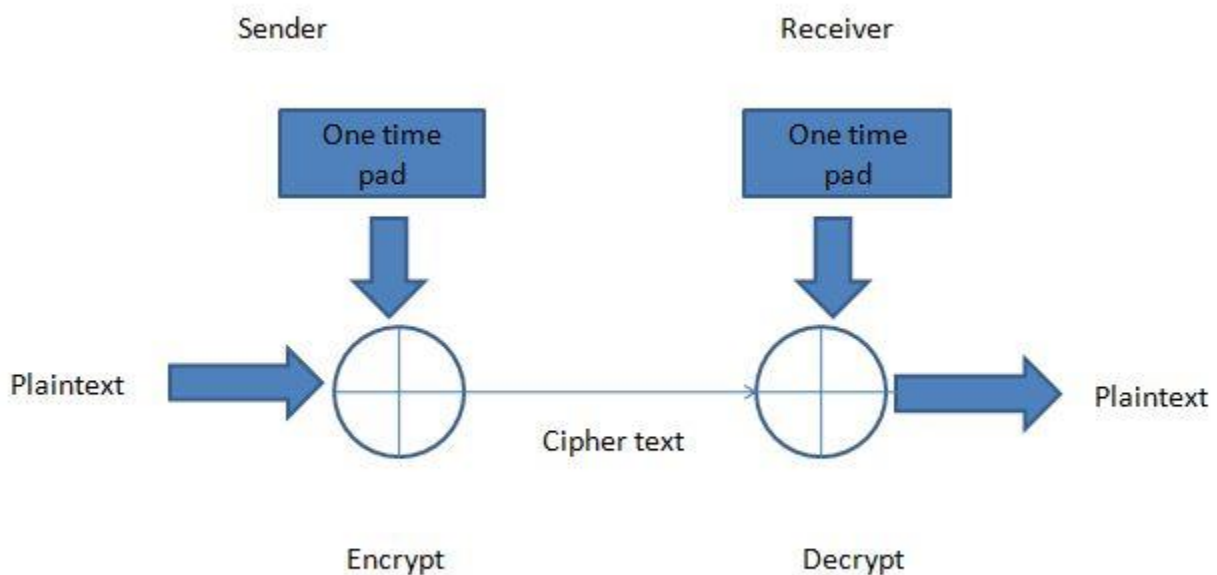


Figure: 3.5.1 Process of one time pad algorithm



### 3.6 Implementation

Key Generation:

- Random Key is generated.
- Key is given to sender and receiver prior to any communication.

```
Key Generation Starts
Generated Key in Character: gFisQJl)M:+r{cF|BTx
Generated Key in Bitstring: 011001110100011001101001011100110101000101111111010010100110110000101
0010100110100111010001010110111001001111011011000110100011001111100010000100101010001111000
```

Figure: 3.6.1 Key generation

Input:

- Sender's message will be encrypted using the symmetric key.
- Receiver will receive the Cipher Text.

```
Encryption Starts
Enter Message to Encrypt: I have sore throat
Message in Bitstring: 010010010010000001101000011000010111011001100101001000000111001101101111011
100100110010100100000011101000110100001110010011011110110000101110100
Encrypted Bitstring: 0010111001100110000000010001001000100111000110100110101000011111010001100011
11110101111100001011000001100001001100010001001010010001110100110110
```

Figure: 3.6.2 Input message for encryption

Output:

- Upon receiving the Cipher Text, receiver will conduct the same symmetric key to decrypt the text.
- A key will be use only once.

```
Decryption Starts  
Decrypted Bitstring: 0100100100100000011010000110000101110110011001010010000001110011011011110111  
00100110010100100000011101000110100001110010011011110110000101110100  
Decrypted Message: I have sore throat
```

Figure: 3.6.3 Output of decrypt message

## **CHAPTER 4**

### **Result Discussion**

#### **4.1 Result**

We (I) attempt a model of such framework has been effectively created and executed, try to keep highly security. Key generation is a big problem, in one pad time algorithm message length and key length will be same, in this system at first key generate than input data or message, key length is congruent with data or message length. After encryption decryption process Receiver receive the same data those are sending by Sender. But sometime give negligible error.

## **CHAPTER 5**

### **Conclusion and Future work**

#### **5.1 Conclusion:**

I have to done my obligation in a very short time period so it was not properly finish. For better security of file transaction thus minimizing the risk & leakage of information.Only authorized persons can send, view and receive the file for the transaction information.

#### **5.2 Future work:**

For future work the implementation can be done combined with various algorithm for provide greater flexibility and reliability and indemnity on the transaction. And it will be use in different sector like job sector, school, college, government and non-government organizations. This framework will offer elevated requirement of human services with a significant decrease in cost for our general public.

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