iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** I **Month of publication:** January 2022

DOI: https://doi.org/10.22214/ijraset.2022.40118

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

Literature Survey for Telemedicine – Portable IoT System to Check Vitals Remotely

PG Pranav Reddy[1], Saketh Dharmasoth[2], Sangati Sai Rohith Reddy[3], Vallurupalli Sai Praneeth[4], Dr. Nagaraj J[5]
[1, 2, 3, 4, 5]*Dayananda Sagar College of Engineering, Bengaluru, Karnataka*

Abstract: ***IOT has been taking over every aspect of this current world. It is being implemented in various everyday things such as traffic management, smart home, agriculture, manufacturing, health care etc. IOT in health care can make the complete system much faster and save lives by reducing the quality time where health care could have been implemented. Telemedicine can be one aspect of health care which can bring great usage to a country like India. Telemedicine can bring health care remotely and even to places with no hospitals. Vitals can be captured and sent to a doctor for healthcare. Due to the remote capabilities of the system health care can be taken to places where roads don't even go. For the development of country medical services, a few government programs have been started, however yet accessibility of value medical services for everything is as yet a fantasy, with quality and number of specialists per capita falling great beneath worldwide normal. Telemedicine as another innovation has offered extraordinary expectation in making medical care open to everything except it has not seen as more extensive acknowledgment. In this paper, we have done a broad review by visiting PHCs in various states, analyzed the existing telemedicine framework on the lookout.***

I. INTODUCTION

A country which is in dire need of more healthcare is India. With increasing population every day and already being the second most populated country in the world, on track to become number one in the near future. There is an increase in healthcare system funding but most of it is being put into the urban areas and rural areas are being ignored to an extent where they do not have enough health care facilities. The Public authority of India has started Public Wellbeing Mission (NHM) to give the necessary medical services to individuals of India. The administrations given by these medical services communities in the rustic regions have made a foundation of wellbeing administrations as CHC/PHCs. These administrations, along with ASHA and Anganwadi laborers have made it conceivable to give most fundamental medical care administrations to a large portion of the rustic and metropolitan populace of India. Work is being done to improve upon this by the National Health Mission with the help of state governments. As of Spring 2021[20], are 30813 PHCs and 5649 CHCs in provincial India. The works done by ASHA laborers are key. According to the 2016 World Health Organization (WHO) report [23], the actual number of health care workers nationwide is only 0.615 per ,000. This is well below the WHO recommended number of doctors per 1000 inhabitants of 1 citizen. Doctor Availability is well below the average words. According to the PricewaterhouseCoopers research report "Future of India: Winning Leap" [22], the availability of doctors in India is to 2.3 in the United States, 1.8 in China and Brazil, and 1.8 per 1000 inhabitants. It's only 0.67 in India which is a really bad thing since it will be much worse in the rural areas.

With the development in technological know-how and technology, a telemedicine gadget may be devised to address the troubles and demanding situations confronted via way of means of the medical doctors and healthcare carriers in rural India. This has the capability to remedy the hassle of accessibility and pleasant of care which could cross an extended manner in presenting Universal Health Coverage (UHC), as described via way of means of the World Health Organization [14]. The is a telemedicine system that caters to the needs of rural India and will greatly help make medical access available to all. Also, addresses the biased proportion of doctors in rural India, and addresses the serious shortage of doctors there. Implementing such a telemedicine system not only breaks the barrier, but also improves the efficiency and quality of the healthcare service. This white paper outlines India's current medical situation and also outlines the specific requirements for telemedicine systems suitable for India. Implementing such a telemedicine system not only breaks the barrier, but also improves the efficiency and quality of the healthcare service. This white paper outlines India's current medical situation and also outlines the specific requirements for telemedicine systems suitable for India.

Health care is provided in rural regions through a network of subcenters and primary health centers. In rural locations, there is a lack of public health infrastructure. As a main health center (including subcenters), community health centers, and district hospitals, a three-tier structure based on the Population Criteria was developed.

1) *Primary Health Centre (PHC):* They act as a mediator among village network and the clinical officer. It comes below minimal wishes program (MNP)/ primary minimal offerings program (BMS) of State government. It is a referral unit for six Sub Centers. It has a clinical officer supported with the aid of using 14 paramedical and different body of workers. Under National Rural Health Mission, extra body of workers nurses are given to PHCs on agreement basis. The sports of PHC contain curative, preventive, primitive and own circle of relative welfare offerings [29]
2) *Sub Centre (SC):* This is where the contact between the primary healthcare system and the community takes place. Services provided by the subcenter relate to maternal and child health, family welfare, nutrition, immunity, diarrhea control, and infectious disease control programs. It has at least one midwife (ANM) / female health care worker and male health care workers. Under NRHM, an additional seconds of ANM will be awarded on a contract basis.[29]
3) *Secondary Health Care Centers:* Here, patient is referred to a higher-level hospital specialist for treatment by PH. Secondary health care centers consists district hospitals and community health centers.[29]
4) *Community Health Centre (CHC):* This corresponds to the State Government Minimum Needs Program (MNP) / Basic Minimum Service Program (BMS). It is a transfer unit for 4 PHC. The has four medical professionals. H. Surgeons, doctors, obstetricians and gynecologists, and pediatricians supported by 21 emergency medical personnel and other staff.[29]
5) *District Hospitals (DH):* Each district has district hospitals. It plays a very important role in the district medical system, providing therapeutic, prophylactic, and basic medical services to the people in the district. Each district hospital is connected to a health center. Just below District are quasi-district / quasi-district hospitals, community health centers, primary health centers, and subcenters.[29]

This paper covers the National Health Mission's 10-year commitment in the countryside of India. NRHM has played an important role in improving the quality of rural health care in . As technology evolved, new systems emerged to replace manual tasks. This white paper describes the limitations of early telemedicine systems and existing devices. These limits are supported by an extensive survey conducted by the team.

II. OVERVIEW

National Health Mission (NHM) exists to provide simple, affordable and quality medical services. This mission talks about national initiatives, programs, outcomes, outcomes, health quality, and funding released for the medical sector. NHM consists of, NRHM,NUHM [3].

Major Strategies were incorporated for improving outreach of health services to public for greater synergy; decentralized planning and innovation in service delivery. The summary* of objectives, goals and strategies are given in table 1[30]

Table 1: Objectives, Goals & Strategies of NRHM[30]

Objectives	Goals	Strategic Changes
Reduction in Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR Population stabilization, gender and demographic balance	Reduce IMR to 25/ 1000 live births . Prevention and reduction of anaemia in women aged 15- 49 years Reduce Total Fertility Rate (TFR) to 2.1 Reduce MMR to 1/ 1000 live births	Strengthening infrastructure at all levels Quality Monitoring of facilities as per Indian Public Health Standards (IPHS) Standard Decentralised planning with autonomy for local action Institutional Mechanisms at all levels with autonomy Induction of management specialist into Programme management Units Centralized technical support unit- National Health Resource Centre and State Health Resource Centre(NHSRC and SHSRC)
Universal access to public health services like women's health, child health, water, sanitation & hygiene, immunization, and nutrition. Promotion of healthy life styles	1. household out –of-pocket expenditure on total health care to be reduced	Decentralised planning with autonomy for local action Capacity- Building of Panchayati Raj institutions Developing capacities for preventive health care at all levels

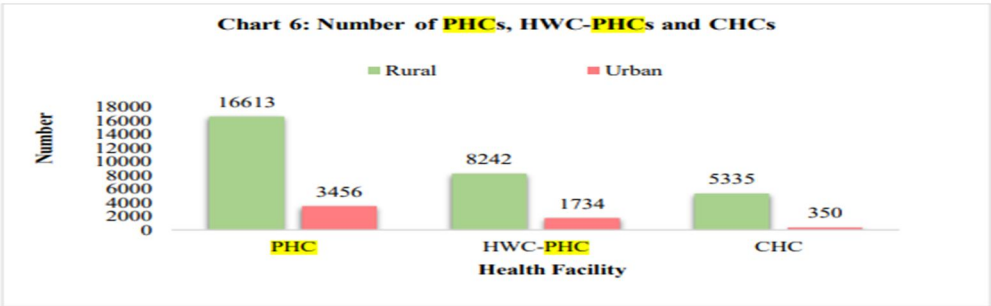
5. Prevention and control of communicable and non-communicable diseases, including locally endemic diseases	Prevent and reduce mortality and morbidity from communicable, non-communicable, injuries and emergency diseases Reduce annual incidence and mortality from Tuberculosis by half Reduce prevalence of Leprosy to <1/10000 population and incidence to zero in all districts Annual Malaria incidence to be <1/1000 Less than 1 per cent microfilaria prevalence in all districts Kala- Azar Elimination by 2015, <1case per 10000 population in all blocks	Integrating vertical Health and Family Welfare programmes Reorienting Medical Education to Rural Health Issues
1. Access to integrated comprehensive primary healthcare 2. Revitalization of local health traditions and mainstream AYUSH	1. Reduce household out –of-pocket expenditure on total health care expenditure	1. Promote ASHA healthcare service delivery 2. Health Plan for each village through VHNSC 3. Untied funds with flexi pools of funds 4. Effective and visible risk pooling and social health insurance 5. Promoting non-profit sector and PPP for achieving goals in underserved areas 6. Mainstreaming AYUSH and local health traditions

*Many Strategic Changes and programme components are overlapping to achieve Goals and Objectives. For convenience they are put in one category

From Tables 2 and 3, we can see that NRHM has hired an additional health care worker of Rs 44.44 million to make up for the public health talent shortage of. AYUSH facility by providing ASHA staff to many of the above Primary Health Centers. It's about 9.36. Lakhs ASHA nationwide provides community-level care. Rogi Kalyan Samiti / Hospital Management Society will take over Maintain the quality of the facilities provided by the hospital. Village Health and Sanitation and Nutrition Committee (VHSNC) provides 10000 grants to each VHSNC under NRHM. Kayakalp aims to promote hygiene in medical facilities. Kilkari delivers free pregnancy and childbirth voice messages each week. These include the Free Pharmaceutical Services Initiative, the Free Diagnostic Services Initiative, the Pradhan Mantri National Dialysis Program, Comprehensive Primary Health Care, ANMOL, and the National Quality Assurance Framework for Health Facilities. According to NHM's report 2016–2020, the trend indicates labor use in rural India [20].

Centers	Population Norms	
	Norm	Avg. Rural Population covered
Sub-centers (SCs)	3000-5000	5616
Primary Health Centers (PHCs)	20000-30000	35567
Community Health Centers (CHCs)	80000-120000	165702

Source: Rural Health Statistics in India 2018-19



[31]

Table E.16

DOCTORS* AT PRIMARY HEALTH CENTRES in Rural Areas

Sl. No.	State/UT	2005 Doctors at PHCs					2019 Doctors at PHCs				
		Required[1]	Sanctioned	In Position	Vacant	Shortfall	Required[1]	Sanctioned	In Position	Vacant	Shortfall
		[R]	[S]	[P]	[S-P]	[R-P]	[R]	[S]	[P]	[S-P]	[R-P]
1	Andhra Pradesh	1570	2497	2137	360	*	1145	1862	1715	147	*
2	Arunachal Pradesh	85	78	78	0	7	143	NA	116	NA	27
3	Assam	610	NA	NA	NA	NA	946	NA	1925	NA	*
4	Bihar	1648	NA	NA	NA	NA	1899	NA	2085	NA	*
5	Chhattisgarh	517	1034	628	406	*	792	792	321	471	471
6	Goa	19	56	53	3	*	24	48	56	*	*
7	Gujarat	1070	1070	848	222	222	1476	2639	2186	453	*
8	Haryana	408	862	862	0	*	379	684	542	142	*
9	Himachal Pradesh	439	354	467	*	*	586	722	486	236	100
10	Jammu & Kashmir	334	668	643	25	*	622	1542	919	623	*
11	Jharkhand	561	NA	NA	NA	NA	298	667	336	331	*
12	Karnataka	1681	2237	2041	196	*	2127	2127	2111	16	16
13	Kerala	911	1345	949	396	*	848	1460	1531	*	*
14	Madhya Pradesh	1192	1278	839	439	353	1199	2024	1053	971	146
15	Maharashtra	1780	3157	3158	*	*	1828	3189	2951	238	*
16	Manipur	72	95	67	28	5	90	238	208	30	*
17	Meghalaya	101	127	123	4	*	118	NA	149	NA	*
18	Mizoram	57	57	35	22	22	59	NA	60	NA	*
19	Nagaland	87	53	53	0	34	126	131	133	*	*
20	Odisha	1282	1353	1353	0	*	1288	1346	813	533	475
21	Punjab	484	646	373	273	111	416	575	562	13	*
22	Rajasthan	1713	1517	1506	11	207	2082	2268	1932	336	150
23	Sikkim	24	48	48	0	*	29	NA	41	NA	*
24	Tamil Nadu	1380	3806	2257	1549	*	1422	2844	1777	1067	*
25	Telangana	-	-	-	-	-	636	1254	1213	41	*
26	Tripura	73	161	152	9	*	108	NA	216	NA	*
27	Uttarakhand	225	272	182	90	43	257	476	269	207	*
28	Uttar Pradesh	3660	NA	NA	NA	NA	2936	4509	3180	1329	*
29	West Bengal	1173	1560	1319	241	*	908	1326	810	516	98
30	A& N Islands	20	36	36	0	*	22	42	34	8	*
31	Chandigarh	0	0	0	0	0	0	0	0	0	0
32	D & N Haveli	6	6	6	0	0	9	12	12	0	*
33	Daman & Diu	3	5	5	0	*	4	8	3	5	1
34	Delhi	8	31	23	8	*	5	7	5	2	0
35	Lakshadweep	4	4	4	0	0	4	8	8	0	*
36	Puducherry	39	63	63	0	*	24	24	41	*	*
	All India[2] Total	**23236**	**24476**	**20308**	**4282**	**1004**	**24855**	**32824**	**29799**	**7715**	**1484**

Note:: Surplus., Telangana came to existence in 2014 after bifurcation of Andhra Pradesh*

1 One per Primary Health Centre, 3 Allopathic Doctors

2 Total given in the Table are not strictly comparable as figures for some of the States were not available in 2005. For calculating the overall percentages of vacancy and shortfall, the States/UTs for which manpower position is not available, may be excluded

All India figures for Vacancy and Shortfall are the totals of State-wise Vacancy and Shortfall ignoring surplus in some States / UTs, For the year 2019 the figures contains data of PHCs and HWC-PHCs

Source : Rural Health Statistics, 2018-19

[31]

A. Rural Medical Infrastructure

There are a total of 160713 Sub Centers operating in India as of March 31, 2019. In rural regions, several of these SCs have been transformed into Health and Wellness Centers (HWCs), and the country now has 5685 Community Health Centers (5335 rural + 350 urban) in operation. In India, there are 17895 HWCs (16063 in rural regions and 1832 in urban areas) that are operational as of March 31, 2019.

the number of CHCs has increased by 17.6% and the number of SCs has increased by 8.3%. As of 2020, India currently has 34 additional DHs [20]. In 2015, the proportion of doctors in Bihar was high, followed by Tamil Nadu. However, in three years, 29% of doctors have decreased. Reasons for this reduction may be due to poor infrastructure, lack of access to laboratories and testing facilities, and so on. In 2018, Rajasthan witnessed a significant increase in the workforce of the Local Health Department. [18] [19]

It is clear that the Government of India has made great advancments in building medical infrastructure and increasing the number of health workers to fill the huge demand gap in rural India. However, looking at the gap in the availability of health care professionals in urban and rural India, 70% of the population lives in rural India. Only 30% of medical professionals work in rural India [24, 26]. This reduces the doctors available in rural India much more seriously. that is the urban population is 1.33 per 1,000, while the rural population is only 0.30, a four-fold difference. Doctors' brain drains and reluctance to leave the Indian countryside for lifestyle and infrastructure reasons exacerbate this situation [27].

Year	SCs	PHCs	CHCs
2005	146026	23236	3346
	SC+HWC-SC	PHCs+ HWC-PHCs	CHCs
2019	157411	24855	5335

Source: Rural Health Statistics in India 2018-19

[31]

Table E.15

NUMBER OF SUB-CENTRES, PHCs, CHCs & HWC FUNCTIONING IN RURAL & URBAN AREAS

Sl. No.	State/UT	(As on 31st March 2019)									
		Sub centre		PHCs		HWC-SC		HWC-PHC		CHCs	
		Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
1	Andhra Pradesh	6825	21	0	121	612	0	1145	243	140	55
2	Arunachal Pradesh	307	0	101	4	78	0	42	0	63	0
3	Assam	4015	19	698	6	628	0	248	49	177	2
4	Bihar	9865	0	1480	0	84	0	419	95	150	0
5	Chhattisgarh	4555	364	657	30	650	0	135	15	170	4
6	Goa	219	0	0	0	0	0	24	0	5	0
7	Gujarat	8353	0	704	247	813	0	772	71	362	14
8	Haryana	2440	32	193	25	164	0	186	72	115	13
9	Himachal Pradesh	2089	8	566	20	0	0	20	0	87	7
10	Jammu & Kashmir	2900	0	526	34	125	0	96	15	84	0
11	Jharkhand	3644	0	203	7	204	0	95	50	171	6
12	Karnataka	9187	251	1995	364	571	0	132	71	198	9
13	Kerala	5380	0	678	83	0	0	170	0	227	2
14	Madhya Pradesh	10226	0	1039	107	0	0	160	29	309	21
15	Maharashtra	9729	0	1349	538	939	0	479	0	364	37
16	Manipur	429	0	85	9	61	0	5	0	23	0
17	Meghalaya	445	0	110	0	32	0	8	0	28	0
18	Mizoram	370	0	57	8	0	0	2	2	9	0
19	Nagaland	377	20	124	2	56	0	2	3	21	0
20	Odisha	6595	0	461	5	93	0	827	82	377	7
21	Punjab	2511	0	79	16	439	0	337	0	89	63
22	Rajasthan	13382	47	1777	320	130	0	305	57	571	24
23	Sikkim	148	0	24	1	28	0	5	0	2	0
24	Tamil Nadu	7728	2183	706	249	985	0	716	214	385	15
25	Telangana	4658	0	0	0	86	97	636	249	85	10
26	Tripura	932	34	82	0	40	0	26	5	18	4
27	Uttarakhand	1804	0	243	0	43	0	14	0	67	0
28	Uttar Pradesh	20056	0	1990	237	726	0	946	387	679	12
29	West Bengal	10195	0	640	448	162	0	268	0	348	39
30	Andaman & Nicobar Islands	96	0	22	0	28	0	0	2	4	0
31	Chandigarh	0	4	0	36	0	0	0	10	0	2
32	Dadra & Nagar Haveli	47	0	6	2	24	0	3	0	2	0
33	Daman & Diu	4	2	0	0	19	1	4	0	0	2
34	Delhi	12	192	5	535	0	0	0	0	0	0
35	Lakshadweep	14	0	4	0	0	0	0	0	3	0
36	Puducherry	53	27	9	2	1	0	15	13	2	2
	All India	**149590**	**3204**	**16613**	**3456**	**7821**	**98**	**8242**	**1734**	**5335**	**350**

Source: Rural Health Statistics in India 2018-19

Note : States/ Uts wise total number of Sub Centres (SCs) and Primary Health Centres (PHCs) figures exclude the number of Health and Wellness Centres- SCs and PHCs both in Rural and Urban areas.

Andhra Pradesh, Goa, Telangana and Daman & Diu have converted all the PHCs(rural) into HWC-PHCs.

[31]

Therefore, the National Rural Health Mission (NRHM) provides basic care for the most common illnesses such as fever, colds, sedentary lifestyles, cholera, diarrhea and tuberculosis (TB) to the majority of the population. It is clear that they have only been partly successful. It also covers child vaccination against common childhood diseases such as DPT and polio, as well as basic pregnancy-related services for pregnant women. But the quality of service and all the most uncommon health issues were clear to serious researchers. This is exacerbated by the lack of access to qualified doctors and specialists for more complex cases, the lack of poor infrastructure, and the lack of access to laboratories and testing facilities. The average distance to medical facilities in rural India is 4.94 km, a quarter live within 5-9 km, and 18% are more than 10 km away [27]. If you have a serious health problem, you should go to a talc hospital or district hospital, which is under great pressure due to the large number of patients. Such visits often result in loss of income and travel problems, with little access to outpatient services and serve as another barrier for the poor. This often leads to the loss of their daily lives, which they can hardly afford. This limits access to basic services for maintaining a healthy lifestyle for people living in rural areas. With advances in science and technology, we can develop telemedicine systems to address problems and challenges.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

III. ALREADY EXISTING WORK

Many patients in the modern era due to new strains of viruses and many more common health problems suffer with diseases difficult to diagnose and treat come to hospitals for medical treatment and care, and the cost of traveling and accommodation is very high for them, mainly for those from the poor or remote far away outskirts areas away from the city or healthcare facility. As networks become more advanced and increase in speed, various energetic activities have started to emerge. New networks will cause a very major revolution in society, and one area, which is expected to be an effective application of new networks, is telemedicine. Telemedicine can be defined as the delivery of health care and sharing of medical knowledge over a distance using telecommunication means. Telemedicine mainly provides medical information exchange at a distance, to support the medical procedure, with the ultimate goal for improving community health care.

Technology for monitoring the health parameters and also the remote healthcare can be divided into three major phases of development, which are

1) *Early Start Phase:* This is the first or early phase of development that was led by developing various sensors and devices mainly for the use of Self-monitoring of health parameters. It was primarily led by development of various bio sensors and emergence of lab-on chip. This was seen to be started in the beginning of 2000 and went up till the middle of first decade
2) *Rapid Development Phase:* It is the secondary period which represents major application of technology for health monitoring and telemedicine systems. It was phase where telemedicine being the major source or solution to a very affordable and accessible stress-free healthcare.
3) *The Technology Maturity Phase:* This is the phase where it was realised the difficulties and practicality was struct and people realised and the spread of tele medicine slowed down, as a result of the bottlenecks and challenges faced by researchers and developers.

A. Telemedicine ECG-Telemetry with Bluetooth Technology (2001)

The initial stages, the most recent Bluetooth communication technology was incorporated to the previously built Internet-based information system, which collects short and long-term digitized ECGs along with pertinent clinical data for patient management. A Bluetooth-based wireless communication protocol for short-range RF data transmission of around 10 to 20 meters was also created. This device could use a GSM telephone modem to deliver compressed records to a Web server. Thrombolysis was done during 3,850 ECG-based telemedicine consultations, 1,663 ambulatory monitoring sessions with online monitoring via the Internet, and 3,850 ECG-based telemedicine consultations. Delay in acute myocardia was evaluated in 36 individuals, with 39 patients with acute myocardial infarction receiving home telecare immediately after release from the hospital, as well as monitoring in a nursing facility.

1) Advantages

The flow of the different information is bi-directional (patient-end and also doctor's end). Because decision-making is mostly based on re-calculated ROC (Receiver Operating Characteristic) curves of various ECG diagnoses, ECG interpretation can be done with incomplete clinical data. As ECG device is portable it is easier to carry out this operation anywhere in the network.

2) Disadvantages

The equipped Bluetooth system has a very small range for limited transmission and it cannot guarantee data privacy as it is easier to tap into the system. It is a very expensive system to carry out services and help in rural or small village areas. A local database is used to store the patient's medical records which only make it harder to access from remote location. As incomplete health or clinical data is used for the interpretation of ECG, correct treatment or the actual side effects of the diseases cannot be determined.

B. Vital Poll Telemedicine System 2004

It is a wireless home healthcare implemented system using Bluetooth, monitors real-time medical data using a client/server architecture along with a hub to collect the data from different medical devices and sensors

Working Method: The VTS was constructed with a three-layer architecture- the VitalPoll Management Center, VitalPoll Manager, VitalPoll Unit, using Celeron 500-MHz CPU, RS232, USB, Personal Computer Memory Card International Association (PCMCIA), Bluetooth module and the Client and Server side was developed using Microsoft Visual C++ and Microsoft Foundation Class development tools.

1) Advantages

The Bluetooth system has a transmission rate of around 723kbps within the 100m radius because of which there is no loss in data. This helps to keep the system performance consistent.

2) Disadvantages

There is a major delay of data transmission if it is beyond 100m radius which shows the unreliability of the system.
Treatment of diseases for a person with incomplete data will only make it harder for diagnosis.
A Bluetooth equipped system cannot guarantee data privacy since it is easier to tap into the system.
It is very expensive system to carry out services in rural or village areas.

C. A Real-Time Wireless Telemedicine System Using Bluetooth 2005

This paper mainly aims to validate and also integrate the wireless Telemedicine System for long term real-time monitoring in clinical practice by testing it on people with pacemaker patients to check if the pacemaker implant is affected by the system and also to assess the system on group of not risky heart patients with heart arrhythmia, monitoring their electrocardiogram (ECG) while carry out their daily activities both indoor and outdoor, using Global System for Mobile Communications (GSM), BLUETOOTH protocol and General Packet Radio Service (GPRS).

1) *Advantages:* The system is very reliable and very easy to use for any user as well as staff. Most of the patients could easily change the electrodes.
2) *Disadvantages:* When patients do their normal day to day activities like driving a vehicle at various speeds, being in different landscape or building environments or probably being close to different interference sources (e.g. microwave oven at home, or other heavy electrical machines outdoor) can, significantly, influence the reliability and the performance of the system. [10, 11]. 50% of the health care professional had lesser understanding of System Function which is a major concern. Security algorithms used in GSM cannot guarantee privacy of data. GPRS speed is very low. The Bluetooth can only work within a certain range and also do not provide data security and it can easily be pinned or any user in a certain range can enter for data .

D. Portable ECG Monitoring Device using Bluetooth 2006

A portable ECG-monitoring device has been developed to mainly provide present and continuous surveillance of patients. The gadget is capable of receiving, storing, and transmitting ECG signals to computer platforms. The collected data can be saved in FAT16 format on a flash memory card for later retrieval.

1) Advantages

There was no loss in data
TransFlash memory card is selected or storage because it is smaller than the others.

2) Disadvantages

Bluetooth cannot transfer or transmit data after a certain range.
Bluetooth are prone to lose connection which results in certain signals getting lost.
If USB is being used, Speed at which data is transmitted is low.
The lack of security during data transmission while using Bluetooth and also chances of being hacked is higher. Therefore, there can be Invasion in Data privacy.

E. Telemedicine Information Monitoring System 2008

A telemedicine information monitoring system was proposed and also prototype was designed. Zigbee protocol was given importance for data transfer. Vital sign data parameters measured were ECG, SPO2, blood pressure, glucose and body temperature, which could be transmitted to the health services information platform.

1) *Advantages:* Patients with a few different cardiovascular disease and diabetes were the targeted audience and this would help them to move freely as this system was wireless and the movement would not be restricted by the wires connected.
2) *Disadvantages:* The Zigbee wireless module can be replaced with a Wi-Fi module for faster date transmission. The system can utilise cloud virtual machines for direct access of confidential data instead of using local servers.

F. Cloud Based Telemedicine Service 2013

The Cloud based Telemedicine idea is mainly based on cloud-computing and real time streaming of videos. The information is available on the WEB in a suitable sorted format, from where, it can be accessed by the authorized medical staff. Cloud based computing has a huge revolutionary effect on telemedicine. According to various specialists and medical researchers, cloud computing can improve healthcare services to large extent.

1) Advantages

Faster to send the data across.

The use of telemedicine system saves you a lot of money as it is cheaper than hospital bills.

It majorly increases productivity, allows their patient to view their own medical records, contact their physician advisor or doctors, monitor their prescription and schedule appointments from their smartphones. It is efficient as it uses real time devices like teleEEG to transmit data to distant areas.

2) Disadvantages

It cannot be used in rural areas or small villages or towns as it is very expensive.

It is not portable. The UI is complex for a layman to understand. Also the use of smartphone as a mediator of information is prone to greater threats as confidentiality of patient's medical records can be easily stolen or misused.

G. Prototype Telepathology solution using Raspberry Pi 2017

The use of smartphones have become even more in developing countries where expert medical consultation or advise is greatly needed, telemedicine, such as the telepathology and telemicroscopy consultations will become more feasible in the most remote places.

1) *Working Method:* The Raspberry Pi was used to host webserver using Apache and that can be accessed with the RPi device id later led to dataplicity.io. Few experiments were done mainly to test the speed of this webserver in two ways, the first was remote user browsing and the second was by adding microscopic image on the server and downloading those from 6 different locations across the globe.
2) *Advantages:* The Tele medicine not only needs photos for assisting and healthcare but even videos can be mandatory or even more use full sometimes which can be archived on a Raspberry Pi server for remote viewing.

H. Current State in India

In the year 2016 a team visited four different states in India which were Bihar, West Bengal, Uttar Pradesh, and Karnataka. They mainly visited the PHC's and District Hospitals. The team showed up to these medical centres with no prior notice or advanced booking of the appointment to mainly record the ground conditions of the centres and the cost of the services provided to the patients by PHCs, SCs, CHCs and DHs in rural India are free. Around 80% of the doctors spend roughly around 2 minutes with a patient during the patients check-ups.After a few patients were interviewed it has been understood they were happy with the treatment regardless of the service provided by the y PHCs and CHCs. The table given shows the service provided by the doctor's in different centres and the little lag in infrastructure and specialised doctors in different healthcare centres. Out of the 17 centres only two we visited saw the use of Telemedicine system. Due to the high complexity in using these machine the centres were only able to treat or diagnose one to two people a day making the treatment cycle take a long time and patience waiting time increase The Kshema telemedicine system in the state of Bihar was not used at all due to lack of maintenance support and expertize needed to operate it. The Sky Health Clinic, started as a partnership between Bihar govt and Milinda Gates Foundation, opened centres in many places in Bihar and a few in Rajasthan. Howevera few of the centres in Bihar were still not functioning well are not functioning at all functional. The telemedicine system was developed by ISRO was installed in a district hospital in Mangalore. It was connected with a few specialists in different govt hospitals in Karnataka. Mainly it was used as a secondary consultation system for only about one or two patients a day.

I. Existing Tele Medicine in India

1) *Telemedicine at Narayana Hrudalaya:* It is partly funded by HP, the system focuses mainly on patients with cardiac. They have cured of around 54000 patients and have a connected 150 centres worldwide.
2) *eVaidya:* It is located in Hyderabad they mainly provide telemedicine system which helps in getting in touch or getting a consolation with the doctor through video call, phone, email, chat. It also provides health information and facts.

3) *KSHEMA telemedicine from KTwo Global:* It is located in Bihar, this telemedicine costs around 8L roughly which measures ECG, temperature, sugar, x-ray by manual input.
4) *TeleVital Telemedicine Network:* It has a large number of users with over 515 installations worldwide this is a preferred system used at ISRO and has treated of about 25000 patient.
5) *e-Sanjeevani:* It was launched in 2009 by union IT minister in India, this system mainly provides tele-consultation.

IV. FUTURE DIRECTION

Even though a few new technology in the area of tele medicine in different regions of India has emerged partially or fully implemented it was not accepted in India due to many reasons technically and physical reasons. It was mainly due to fast pace in technology and development in the country it has been very difficult in matters like reimbursement policies, privacy protection, healthcare and many more protection, and healthcare laws. Moreover, technology is expensive. One of the key technological challenges in India is the required internet band-width for telemedicine systems.

There are a few concerns arising in Telemedicine which are looked into for the future technology which are

A. Concern Regarding the Security of the Personal Data

As private and also sensitive information will be shared in between doctors and patients in the form of video call, message, pictures and a few more forms it cannot be safe in all platforms as the **information can be stolen.**

B. Concern on Physician Licensing

Telemedicine is a way for the physician or the doctor can treat a patient's nationwide bit in a few countries there is a needed permission for treatment of patients.

C. Technical Training for the using of the Equipment

Training a Staff is a very crucial part in Telemedicine as so to save time and money as a small number of people staff should be trained for the program. Physicians, practice managers, and other medical staff have to be trained on the new systems to ensure a solid ROI.

V. GAP ANALYSIS

The Tele medicine systems which ever are present currently are good and use full for few selective centers and urban area centers. But for rural areas the telemedicine system has to be easily available less in cost and reliable and easy to use.

1) A very cost-efficient solution for collecting and processing the patient's data
2) It should be wireless connectivity of bio sensors so that it can be easy to use for the staff in rural areas.
3) The system has to be very reliable and the parts of telemedicine should be comparatively cheaper and easily available.
4) The user interface for the telemedicine system should be easy to use and should be workable or easy to make it work for a decent staff of the health department.
5) The telemedicine system should not depend on electricity when it used or its under operation or a process
6) As we need to make it work in different regions of India the telemedicine system should provide the option of Native Language Support so it can be easier for people in a few regions to use it.

VI. CONCLUSION

As we all know India is still a developing country and does not have all the resources for a sudden improvement but after a few recent incidents like the pandemic we all have come to the notice that India is lagging way back in the health care part compared to a few other countries. India mainly lacks due to structural constraints, lack of incentives and resources, lack of access to doctors, specialized doctors, lab facilities, and a few more reasons also. Healthcare is drastically less especially in the rural area and that is where tele medicine comes to play as it is easy to transmit data regarding the health of the patient to any doctor and also it is very cost effective, and also more accurate diagnosis of patients can be provided with help of tele medicine system and a few more advantages like, provide tentative decisions regarding their treatment, reduce the loss of time.

But there are a few problems when it comes to using these systems in rural areas which have to be kept to mind which are

1) The need of fast internet and not just limited access so data can be shared faster.
2) The system should be sustainable with a proper skilled staff so the work process can be executed in the proper format and no delay or problems.
3) The interchange of Data with other health care centers.

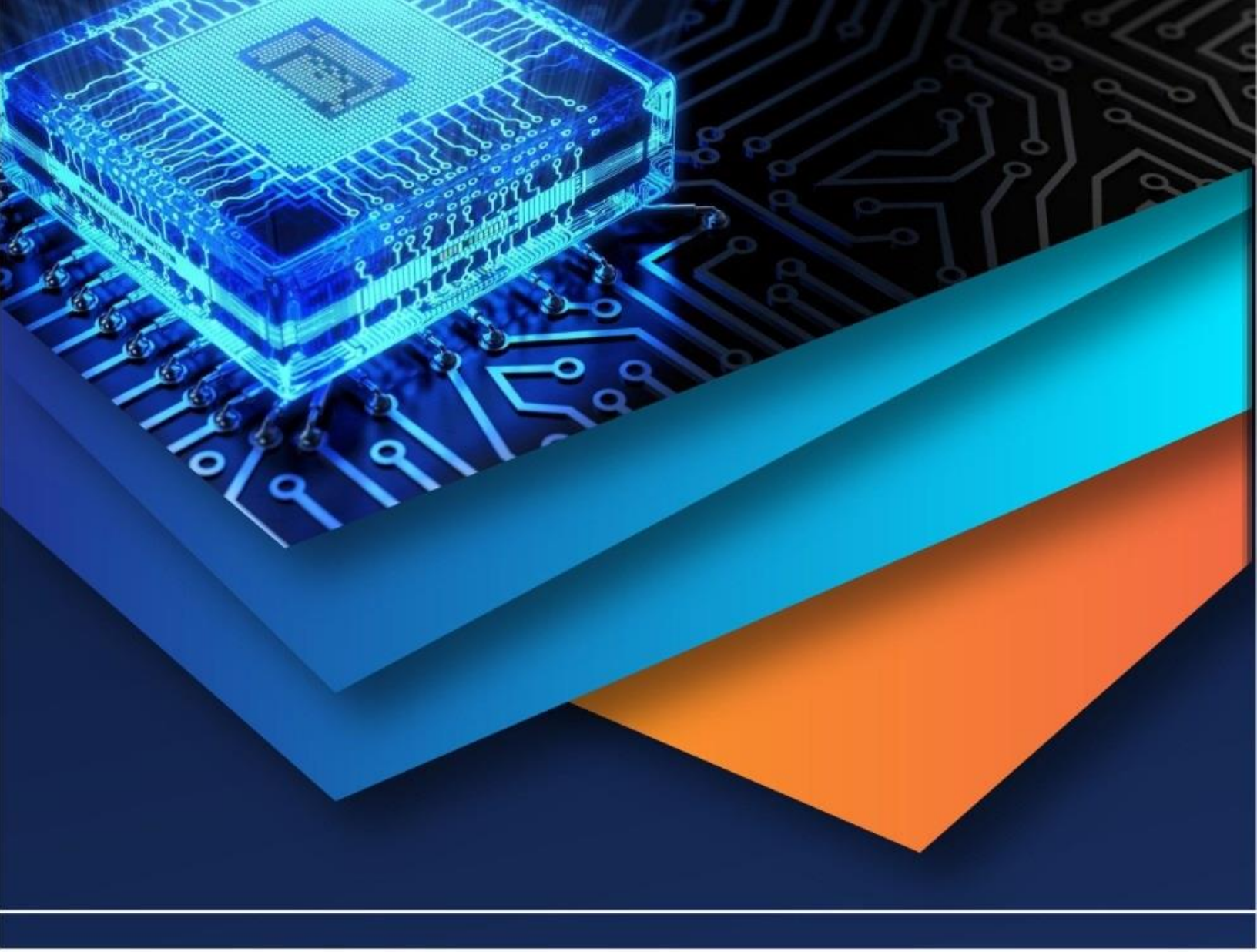
4) The system should be easy to use and not very complicating and it should be very cost effective or cheap.

5) The people in rural areas should trust the process and technology as many people in rural areas are not well aware of modern-day technology much

Telemedicine shows a really good future in India for improving the health care side especially for rural areas for both patients and also doctors and physicians where the infrastructure, cost and distance plays a major role.

REFERENCES

[1] The Health Resources and Services Administration (HRSA). The U.S. Department of Health and Human Services. Link: https://www.healthit.gov/topic/health-it- initiatives/telemedicine-and-telehealth
[2] National Helath Mission Annual Report 2016-2017. Link: https://main.mohfw.gov.in/sites/default/files/02Chapter.pdf
[3] National Helath Mission Annual Report 2019-2020. Link: https://main.mohfw.gov.in/sites/default/files/Annual%20R eport%202019-2020%20English.pdf
[4] Zhao X, Fei DY, Doarn CR, Harnett B, Merrell R. A telemedicine system for wireless home healthcare based on Bluetooth and the Internet. Telemed J E Health. 2004;10 Suppl 2:S-110-6. PMID: 23570221.
[5] C. Raj, C. Jain and W. Arif, "HEMAN: Health monitoring and nous: An IoT based e-health care system for remote telemedicine," 2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), Chennai, 2017, pp. 2115-2119, doi: 10.1109/WiSPNET.2017.8300134.
[6] S. Khoor, K. Nieberl, K. Fugedi and E. Kail, "Telemedicine ECG-telemetry with Bluetooth technology," Computers in Cardiology 2001. Vol.28 (Cat. No.01CH37287), Rotterdam, Netherlands, 2001, pp. 585-588, doi: 10.1109/CIC.2001.977723.
[7] Matlani, P., & Londhe, N. (2013). A cloud computing based telemedicine service. 2013 IEEE Point-of- Care Healthcare Technologies (PHT), 326-330.
[8] Lucani D, Cataldo G, Cruz J, Villegas G, Wong S. A portable ECG monitoring device with Bluetooth and Holter capabilities for telemedicine applications. Conf Proc IEEE Eng Med Biol Soc. 2006;2006:5244-7. doi: 10.1109/IEMBS.2006.260798. PMID: 17946295.
[9] Yousef J, Lars AN. Validation of a real-time wireless telemedicine system, using bluetooth protocol and a mobile phone, for remote monitoring patient in medical practice. Eur J Med Res. 2005 Jun 22;10(6):254-62. PMID: 16033715.
[10] Jasemian Y, Nielsen LA. Design and implementation of a telemedicine system using Bluetooth protocol and GSM/GPRS network, for real time remote patient monitoring. Technology and Health Care : Official Journal of the European Society for Engineering and Medicine. 2005 ;13(3):199-219.
[11] Jasemian Y, Arendt-Nielsen L. Evaluation of a realtime, remote monitoring telemedicine system using the Bluetooth protocol and a mobile phone network. J Telemed Telecare. 2005;11(5):256-60. doi: 10.1258/1357633054471911. PMID: 16035969.
[12] D. U. Ekong and P. Fontelo, "Prototype telepathology solutions that use the Raspberry Pi and mobile devices," 2017 IEEE Global Humanitarian Technology Conference (GHTC), San Jose, CA, 2017, pp. 1-4, doi: 10.1109/GHTC.2017.8239263.
[13] Hsu Chih-Jen, "Telemedicine information monitoring system," HealthCom 2008 - 10th International Conference on e-health Networking, Applications and Services, Singapore, 2008, pp. 48-50, doi: 10.1109/HEALTH.2008.4600108.
[14] World Health Organization Link: https://www.who.int/gho/goe/telehealth/en/
[15] Mortality Rates Link: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=165 8266
[16] United Nations in India Link: https://in.one.un.org/task- teams/universal-health-coverage/
[17] Manpower Utilization State Wise Link:https://nrhmmis.nic.in/RURAL%20HEALTH%20STATISTICS/(A)%20RHS%20%202018/Status%20of%20Health%20Manpower%20in%20Rural%20areas.pdf
[18] Government of India Rural Health Statistics 2014-15 Link: https://wcd.nic.in/sites/default/files/RHS_1.pdf
[19] Government of India Rural Health Statistics 2018-19 Link: https://main.mohfw.gov.in/sites/default/files/Final%20RH S%202018-19_0.pdf
[20] Quarterly NHM Reports 2012-2020 Link: https://nhm.gov.in/index4.php?lang=1&level=0&linkid=45 7&lid=686
[21] Indian Institute of Public Opinion Link: http://jtbsrr.in/files/documents/13.JTBSRR.pdf
[22] Future of India the Winning Leap by PWC Link: https://www.pwc.com/sg/en/publications/assets/future-of- india-the-winning-leap.pdf
[23] THE HEALTH WORKFORCE IN INDIA report by WHO in 2016. Link: https://www.who.int/hrh/resources/16058health_workforce_India.pdf
[24] DIGITAL TECHNOLOGIES & TRANSFORMATION OF HEALTHCARE IN INDIA, by R CHANDRASHEKHAR FORMER PRESIDENT, NASSCOM; 2025: A Healthcare Odyssey conference Jul 2018 Siemens Healthineers
[25] Half empty or half filled? notes on universal health coverage in northeast India by Jayanta B Sarma and Rituparna Bhattacharyya; The Clarion Volume 4 Number 1
[26] Health care in rural India: A lack between need and feed by Sandeep Singh and Sorabh Badaya; South Asian J Cancer. 2014 Apr-Jun; 3(2); URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4014652/
[27] Does distance matter for institutional delivery in rural India? by Santosh Kumar; Applied Economics 30 Aug 2014; https://www.tandfonline.com/doi/pdf/10.1080/00036846.2 014.950836#:~:text=The%20mean%20distance%20to%20the,was%20located%20beyond%2010%20km.
[28] Academic Institutionalization of Community Health Services: Way Ahead in Medical Education Reforms by Journal of Family Medicine and Primary Care
[29] Literature survey for Sahara – Systematic analysis of healthvitals in an automated real-time atmo Available online at: https://www.ijariit.com
[30] National Health Mission (NHM) Manual for District- Level Functionaries https://darpg.gov.in/sites/default/files/National%20Health%20Mission.pdf
[31] HEALTH AND FAMILY WELFARE STATISTICS IN INDIA 2019-20



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY