



## **PROSPECTS AND CHALLENGES OF TELEMEDICINE: A NEW PARADIGM FOR HEALTHCARE DELIVERY IN DASS LOCAL GOVERNMENT AREA OF BAUCHI STATE**

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### **Abstract**

*Good healthcare services and medical specialists are usually concentrated in urban areas. Patients cannot often afford transportation to the nearest health care centre providing the necessary medical services. Provision of support and continuous medical education for those health care professionals working in rural areas are extremely difficult. The ability of telemedicine in the utilization of scarce medical personnel and resources irrespective of distance and availability of personnel on site makes it attractive in healthcare delivery to both rural and urban areas. In particular, telemedicine may be seen as a valuable tool for providing much needed medical services to remote rural areas. The study ascertains the possibility of future success that telemedicine could attained by showing the low level of availability of the services in Dass Local government area of Bauchi State, Nigeria. In addition to showing the low degree of application of the services in the area, some pressing issues affecting the prospects of the services in the healthcare delivery were highlighted. 100 questionnaires were administered in which 93 were returned, the data were analyzed using both descriptive and inferential statistics. Mean and standard deviation were used in discussion of results. The study paved a way of addressing the challenges that hinders the development of the services in the area.*

### **Introduction**

The demand on the healthcare systems in Nigeria is becoming more complex due to the disarray and unfocussed nature of healthcare delivery and shortage of healthcare professionals (Femi *et al.*, 2017). Any increase in population

growth result in the corresponding increase of healthcare cost, it equally overstretched social and educational resources (Awolola, 2015). Statistics has shown that Nigerian doctors to patients ratio is 1:6,400 as against the standard of the World Health Organization of 1:600 (WHO, 2014).

Many developing countries including Nigeria are facing various problems in delivering health care and medical services to their population (Femi *et al.*, 2017). Inadequate funds as well as a drastic shortage of trained and experienced doctors and nurses, poor roads, limited transportation facilities are some of the factors affecting the accessibility of health care services to rural communities and remote areas (Ajala, Adentuji and Akande, 2015). Telemedicine is a feasible tool to address at least some of these issues.

Telemedicine is defined as the use of telecommunication technologies to provide medical information and services. It may be as simple as two health professionals discussing a patient's case over a telephone line, or as sophisticated as using satellite technology to broadcast a country using video conferencing equipment. (James *et al.*, 2015).

Telemedicine allows better utilization of scarce medical personnel and resources. It enhances citizen's equality in the availability of various medical services and healthcare despite geographical and economic barriers, at a lower cost. In particular, telemedicine may be seen as a valuable tool for providing much needed medical services to remote rural areas (Kituyi *et al.*, 2012).

The fact that economic health depends on medical health, since health is wealth, implies that health care needed to be accessible to all including the rural communities (Akintosin, 2015) which if compromised could undermine the entire socioeconomics fabrics of the country (Imouokhome and Osubor, 2012). Today, patients are able to acquire healthcare information through the Internet (Ayemi and Misra, 2014), resulting in smarter patients with higher expectations and a demand for high-standard quality care (Justice, 2012). The review of the health-care system, the level of its decline, the services provided, and the general health status of Nigerians, with the available data revealed that the Nigerian health-care system is characterized by poor infrastructure (Kituyi *et al.*, 2012), high infant mortality rates, and poor nutritional status of children (Van *et al.*, 2015). This problem is equally compounded by high fertility rates and high maternal mortality rates (Awosika, 2005). With the Nigeria's health care system undergoing profound changes and experiencing relentless financial

pressures, there is need to consider telemedicine application in urban as well as rural settings (Griggs *et al.*, 2013). In many countries (Nigeria for example), telehealth has also recently evolved as a potentially clinically appropriate and cost effective means of supporting patients and providers in changing the health care system (Miller *et al.*, 2003).

The healthcare system of Nigeria consists of primary, secondary and tertiary levels (Awosanya, 2015). These levels are under the three tiers of government namely Federal Ministry of Health (FMOH, 2001), State and Local respectively. The local governments provide primary level of services (lowest level of service) through Primary Health Care (PHC) centres. The state governments are responsible for secondary level of healthcare and deliver service through general hospitals (Ajala, Adentuji and Akande, 2015). Finally, it is the responsibility of the Federal Ministry of Health to deliver tertiary care through highly specialized services in teaching hospitals and federal medical centres (Makinde, 2014). The responsibilities of these three tiers of government in the delivery of health service overlap in one way or the other (Stanberry, 2001). State governments provide some tertiary care through state-owned teaching hospitals, tertiary institutions also provide PHC services through their general outpatient department (Ayemi and Misra, 2014) while the Federal Ministry of Health through National PHC Development Agency develops policies, develops PHC physical structures and supervises the operations of PHC centers (FMOH, 2001).

### **Objectives of the Study**

The main aim of this study is to ascertain the possibility of future success of telemedicine on health care delivery in Dass Local Government Area of Bauchi State in Nigeria. However, the study will also investigate the availability of telemedicine services in the local government's healthcare system as well as determining the degree of application of telemedicine services and their corresponding challenges.

### **Literature Review**

Shittu and Olamide (2007) conducted a study to determine the perception of health workers in the health-care towards telemedicine application in a new tertiary teaching hospital, a modified structured questionnaire using a

prospective postal survey was administered to a cross-section of health workers in Lagos State University Teaching Hospital (LASUTH) and Lagos State University College of Medicine (LASUCOM). Only 60.9 % of respondents were familiar with this new emerging concept of telemedicine in the health care system. Although, 50.0 % of health workers had expressed concern about the ethical and medico-legal consideration of telemedicine practice. Other results obtained from the study showed knowledge of telehealth applications (28.1 %); perception of telehealth benefits (14.1 %). Most of the respondents (23.4 %) believed that telehealth would enhance direct access to health care services.

Banjoko and Omoleke (2008) carried out a study to assess the Knowledge and Perception of Telemedicine and E-health by Some Nigerian Health Care Practitioners. In this study, 200 healthcare providers including doctors, nurses, pharmacists, laboratory scientists, medical records officers, radiographers, senior nursing and senior medical students were respondents in the assessment of their knowledge and perception using interviews and semi-structured questionnaire. 83 (41.5 %) of the respondents had poor knowledge of telehealth and only 42 (21.0 %) were aware of the country's proposed telehealth programme. 141 (70.5 %) will use telehealth services and 138 (69.0 %) will recommend its use to others. 134 (67 %) believed it should be included in the three tier health system while 114 (57 %) thought it should be a special programme. 162 (81 %) of the respondents were positive on the relevance and benefits of telehealth introduction to the Nigerian health system.

Justice (2012) carried out a study on the assessment of telemedicine readiness in some selected states in Western Nigeria. Considering some critical factors of e-Health readiness such as engagement and structural readiness. The responses were analysed statistically using descriptive analysis. The result of the overall evaluation of all samples shows that health managers are not structurally ready, the public and patient fairly agreed.

Marcia et al., (2014) carried out a study on the extent of telehealth use in rural and urban hospitals. Data was gotten from 4,727 hospitals in the 2013 Healthcare Information and Management Systems Society (HIMSS) and their analysis yielded these findings: Two-thirds (66.0 % of rural and 68.0 % of urban) had no telehealth services or were only in the process of implementing a telehealth application. One-third (34.0 % rural and 32.0 % urban) had at least

one telehealth application currently in use. Among hospitals with “live and operational” telehealth services, 61.4 % indicated only a single department/program with an operational telehealth service, and 38.6 % indicated two or more departments/programs with operational telehealth services. Rural hospitals were significantly less likely to have multiple services (35.2 %) than were urban hospitals (42.1 %). Rural and urban hospitals did not differ significantly in overall telehealth implementation rates but did differ in the department where telehealth was implemented. Urban hospitals were more likely than rural hospitals to have operational telehealth implementations in cardiology/stroke/heart attack programs (7.4 % vs. 6.2 %), neurology (4.4 % vs. 2.1 %), and obstetrics/gynecology/NICU/pediatrics (3.8 % vs. 2.5 %). In contrast, rural hospitals were more likely than urban hospital to have operational telehealth implementations in radiology departments (17.7 % vs. 13.9 %) and in emergency/trauma care (8.8 % vs. 6.3 %).

Ajala, Adentuji and Akande (2015), conducted a study in south western Nigeria that evaluates the degree of awareness and availability of telemedicine services in the area as well as its prospects and challenges. The respondents who are mostly medical personnel were drawn using sampling method. Results obtained indicated that only few medical services have integrated telemedicine into their services.

The study of Femi *et al.* (2017) explores various ways in which telemedicine has assisted in achieving developmental goals on global healthcare coverage. The study adopted qualitative analysis and concluded that telemedicine is unavoidable, and therefore become necessary and extremely beneficial with a positive a prospects in servicing the healthcare system in Nigeria and West Africa.

### **Materials and Methods**

The study is a survey research where data are collected from a representative sample of medical staff of Dass local government area using questionnaire.

### **Location and Case Study**

Bauchi State is one of the thirty-six (36) states of Nigeria located in the North eastern part of the country. It has 23 local governments in which Dass is one of

them, it has land mass of 535 Km- square with a projected population of the 2006 census to about 150,000 (NPC, 2014).

### **Population of the Study**

The population of the study consists of one hundred and forty-seven (147) medical staff (Doctors 36, Nurses 56 Laboratory Technologists 18 and Pharmacists 37) in Dass Local Government Area of Bauchi State. There are four Health care Centers in the Dass.

### **Sample and Sampling Techniques**

The researcher used the stratified random sampling technique for the study to draw sample from the strata of a very large population. The health workers were stratified according to their cadre. The sample size of respondents that was used for this study was ninety-three (93) respondents comprising 18 doctors, 40 nurses, 12 laboratory technologists and 23 pharmacists all of which are from the population of one hundred and forty-seven (147).

For the purpose of this study, the sample size was determined using Taro – Yamen’s formula. The formula was adopted because it takes care of the level of precision required to accommodate the probable sample error

### **Instrument for Data Collection**

This study employed questionnaire as data collection instrument. The questionnaire is in two sections namely; sections A and B. Section A requires information on respondents’ profile such as name of hospital, gender, status and years of experience while section B has 6 parts with each part containing items covering a specific objective of the study. Each item has four (4) response options of Strongly Agreed (SA), Agreed (A), Disagreed (DA) and Strongly Disagreed (SD).

### **Data Analysis Techniques**

The data were analyzed using both descriptive and inferential statistics. Mean and standard deviation were used to answer research questions.

## Results and Discussion

This section presents results of the data analysis and discusses the findings of the research. The results of the study were presented according to research objectives as follows:

To achieve the first objective which investigated the availability of telemedicine services was collected and subjected to analysis using mean and standard deviation as presented in Table 1.

Table 1: Mean Ratings and Standard Deviation of Respondents on the Degree of Availability of Telemedicine Services in Dass Local government in Bauchi State Nigeria (N= 93: n1 = 18 Doctors; n2 =40 Nurses; n3 =12 Laboratory Technologist and n4= 23 Pharmacists)

| S/N Items  | N  | $\bar{X}$ | SD   | Remark     |
|--|----|-----------|------|------------|
| 1 Reliable internet service  | 93 | 1.83      | .79  | Low Extent |
| 2 Computerized laboratory system   | 93 | 1.81      | .85  | Low Extent |
| 3 Computerized pharmacy system   | 93 | 2.08      | .88  | Low Extent |
| 4 Search and locate patient system   | 93 | 1.94      | 1.01 | Low Extent |
| 5 Real-time patient consultations  | 93 | 1.95      | .88  | Low Extent |
| 6 Remote monitoring of patient's vital signs and conditions                            | 93 | 1.95      | .58  | Low Extent |
| 7 The storing and forwarding of critical health information for analysis and diagnosis | 93 | 2.09      | .95  | Low Extent |
| 8 The provision of specialized services over long distances                            | 93 | 1.65      | 1.03 | Low Extent |
| 9 The wide availability of health information to patients and care givers              | 93 | 2.46      | .82  | Low Extent |

N= number of respondents,  $\bar{X}$ = mean of respondents SD = Standard deviation of respondents.

Result in Table 1 showed the responses of respondents on degree of availability of Telemedicine Services in Dass Local government in Bauchi State Nigeria. All the nine items recorded mean scores ranging from 1.65 to 2.46 indicating

that their mean values were below the real limits of mean 2.50 and 3.49. This showed that all the telemedicine services in Dass Local government in Bauchi State Nigeria are available to a Low extent. The Table further showed that the standard deviation of the items ranged from .58 to 1.03, indicating that there was less variability in the opinion of the respondents on the degree of availability of telemedicine services in Dass Local government in Bauchi State Nigeria.

Table 2, shows the degree of applications of telemedicine services in Dass local government.

Table 2: Mean Ratings and Standard Deviation of Respondents on the Degree of Application of Telemedicine in Dass Local government in Bauchi State Nigeria (N= 93: n1 = 18 Doctors, n2 =40Nurses, n3 =12 Laboratory Technologist and 23 Pharmacists)

| <b>S/N Degree of Application of Telemedicine</b>   | <b>N</b> | <b><math>\bar{X}</math></b> | <b>SD</b> | <b>Remark</b> |
|--|----------|-----------------------------|-----------|---------------|
| 10 Management of specific diseases   | 93       | 1.83                        | .62       | Low Extent    |
| 11 Use within specific specialties   | 93       | 1.78                        | .65       | Low Extent    |
| 12 Classification according to technology  | 93       | 1.76                        | .61       | Low Extent    |
| 13 Types of clinical problems  | 93       | 1.80                        | .63       | Low Extent    |
| 14 Provide access for their local populations  | 93       | 1.76                        | .61       | Low Extent    |
| 15 Bring specialty services to the local Area in a collaborative fashion   | 93       | 2.44                        | .67       | Low Extent    |
| 16 Decrease out migration of patients based On perception of available services and the Quality of those services; | 93       | 2.33                        | .73       | Low Extent    |
| 17 Decrease unnecessary transports to Tertiary care facilities;  | 93       | 2.18                        | .77       | Low Extent    |
| 18 Provide practitioner support  | 93       | 2.16                        | .77       | Low Extent    |
| 19 Increase utilization of local ancillary services  | 93       | 2.28                        | .65       | Low Extent    |

N= number of respondents,  $\bar{X}$ = mean of respondents SD = Standard deviation of respondents.



The result in Table 2 revealed that all the ten items recorded mean scores ranging from 1.76 to 2.44 indicating that their mean values were below the real limits of mean 2.50 and 3.49. This showed that there was low degree of application of telemedicine in Dass Local government in Bauchi State Nigeria. The Table further showed that the standard deviation of the items ranged from 0.61 to 0.77, indicating that there was less variability in the opinion of the respondents on the degree of application of Telemedicine in Dass Local government in Bauchi State Nigeria.

Conversely, Table 4, indicates the data on challenges associated with the use of telemedicine in Dass Local government in Bauchi State Nigeria.

**Table 4: Mean Ratings and Standard Deviation of Respondents on Challenges Associated with the Use of Telemedicine in Dass Local government in Bauchi State Nigeria (N= 93: n1 = 18 Doctors, n2 =40 Nurses, n3 =12 Laboratory Technologist and 23 Pharmacists)**

| S/N | Challenges of Telemedicine Utilization | N  | $\bar{X}$ | SD  | Remark |
|-----|--|----|-----------|-----|--------|
| 20  | Inadequate medical practitioners       | 93 | 2.84      | .92 | Agreed |
| 21  | Inadequate patient record              | 93 | 3.26      | .68 | Agreed |
| 22  | Time consumption                       | 93 | 2.86      | .93 | Agreed |
| 23  | Insufficient medical records           | 93 | 3.62      | .68 | Agreed |
| 24  | Difficult remote access                | 93 | 3.59      | .71 | Agreed |
| 25  | Difficulty in retrieving record        | 93 | 2.80      | .92 | Agreed |
| 26  | Unfavorable government policy          | 93 | 2.84      | .92 | Agreed |
| 27  | Poor funding                           | 93 | 3.23      | .66 | Agreed |
| 28  | Poor internet facilities               | 93 | 2.83      | .94 | Agreed |
| 29  | Ethics and legal issues                | 93 | 3.19      | .68 | Agreed |
| 30  | Challenges to patient privacy          | 93 | 3.19      | .69 | Agreed |
| 31  | Insecurity                             | 93 | 3.21      | .70 | Agreed |
| 32  | Poor level of satisfaction             | 93 | 3.18      | .70 | Agreed |
| 33  | Inadequate of infrastructure           | 93 | 2.80      | .95 | Agreed |

N= number of respondents,  $\bar{X}$ = mean of respondents SD = Standard deviation of respondents.

Data presented in Table 4 showed the responses of respondents on challenges associated with the use of telemedicine Results obtained revealed that all the fourteen items recorded mean scores ranging from 2.80 to 3.62 indicating that their mean values were above the cut-off point of mean 2.50. This showed that all the items were agreed by respondents as the challenges associated with the use of telemedicine in Dass Local government in Bauchi State Nigeria. The Table also showed that the standard deviation of the items ranged from .66 to .95, indicating that there was less variability in the opinion of the respondents on the challenges associated with the use of Telemedicine in Dass Local government in Bauchi State Nigeria.

## **Conclusion**

Telemedicine is an essential assets of healthcare system of a country, it is most significantly used in times of disaster, and as such should not be compromised in any way. Therefore, several steps need to be taken in other to promote telemedicine services in Dass local government area of Bauchi state Nigeria. The study will as well enable new polices and frameworks to be formulated by government at all levels to address the challenges faced by telemedicine services.

## **References**

- Ajala Adetunji and Akande (2015). Telemedicine accessibility in South Western Nigeria: Its Prospects and Challenges. *Comsoft, An International Journal of Advanced Computer Technology*. Vol 4, No 9.
- Akintosi, J. (2015). The status of telemedicine in Africa: The role of broadband. Retrieved from <http://nuviun.com/content/the-status-of-telemedicine-in-africa/> July 2016.
- Awolola O. J. (2015): Utilizing Telemedicine and eHealth to help with Capacity Building of Healthcare Professionals in Africa. *Excerpt from proposed West Africa Telemedicine Center of Excellence at the University Of Ilorin Teaching Hospital College Of Health Sciences, Kwara State, Nigeria.*

- Awosanya, Y. (2015) APMIS: Using Technology as a Transforming agent in the healthcare sector. Retrieved from <https://techpoint.ng/2015/04/14/apmis-using-technology-disruptive-agent-healthcare-sector/> July 2016.
- Awosika, O. D. (2005). The Ominous Nigerian Health Care System: Is there a hope for solution? [www.dawosikaolumo. neo.rr.com](http://www.dawosikaolumo.neo.rr.com), accessed 10th July, 2010.
- Ayeni, F., and Misra, S.: Overcoming Barriers of Effective Health Care delivery and Electronic Health Records in Nigeria Using Socialized Medicine. *International Conference on Electronics Computer and Computation (ICECCO), 2014 IEEE International Conference*, pp. 1-4, (2014).
- Banjoko, S.O. and Omoleke , I.A. (2008). Knowledge and Perception of Telemedicine and Ehealth by Some Nigerian Health Care Practitioners. *International journal of science research*, 4: 17-22.
- Federal Ministry of Health (2001): National Strategic plan for improving E-Health in Nigeria. *Federal Ministry of Health Annual Publication, Abuja, Nigeria*. 4 (2): 35–41.
- Femi Ekanoye, Temitope Olokunde, Foluso Ayeni, Vekima Nina, Carole Donalds, Victor Mbarika. Telemedicine Diffusion in a Developing Country: A Case of Nigeria. *Science Journal of Public Health*. Vol. 5, No. 4, 2016, pp. 341-346. doi: 10.11648/j.sjph.20170504.20
- Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M. C., Shyamsundar, P., and Noble, I. (2013). *Policy: Sustainable development goals for people and planet. Nature*, 495 (7441), 305-307.
- Imouokhome F. A. and Osubor V. I. (2012) “MobileDevice-Based Telemedicine for Improved HealthWealth”, *African Journal of Computing and ICTs*, Vol 5, No. 5, Pp. 109-142-145.
- James, K.G., Odimayomi, P.K. and Shaba, A.H.(2015). Telemedicine Development in Nigeria, *National Space Research and Development Agency (NASRDA), Abuja Nigeria*, 92-103.
- Justice, E.O. (2012). E-Healthcare/Telemedicine Readiness Assessment of Some Selected States in Western Nigeria. *International Journal of Engineering and Technology*, Vol 2, No 2: 41-47.
- Kituyi GM, Rwashana A, Mbarika V, Isabelija R. (2012), “ A Framework for Designing Sustainable Telemedicine Information Systems in Developing Countries”, *Emerald Journal of Systems and Information Technology*, Vol. 14, No. 3, Pp. 200–219.
- Makinde, O. A., Azeez, A., Bamidele, S., Oyemakinde, A., Oyediran, K. A., Adebayo, W., & Mullen, S. (2014). Development of a master health facility list in Nigeria. *Online journal of public health informatics*. Vol 6, No 2.
- Marcia, M., Fred, U. and Keith, M. (2014). Extent of Telehealth use in Rural and Urban Hospitals. *Rural Policy Brief*, Vol 4, 13-17.
- Miller T.W., Burton, D., Sprang, R., and Adams, J. (2003). Telehealth: A Model for Clinical Supervision in Allied Health. *The International Journal of Allied Health Science. And Practice*. July, 1(2): 34-42.

- Nigeria Demographic and Health Survey (2014): National Population Commission, Abuja, Nigeria
- Shittu, L. A. and Olamide, A. A. (2007). Knowledge and perception of health workers towards tele-medicine application in a new teaching hospital in Lagos. *Scientific Research and Essay*, Vol 2, No 1 pp 16-19.
- Stanberry, B. (1998). The legal and ethical aspects of telemedicine. *Journal of Telemedicine and Telecare*, Vol 4, pp 95–97.
- Van Gurp, J., Soyannwo, O., Odebunmi, K., Dania, S., van Selm, M., van Leeuwen, E., Hasselaar, J. (2015), Telemedicine’s Potential to Support Good Dying in Nigeria: A Qualitative Study. *PLoS ONE*, Vol. 10, No. 6
- World Health Organization. Health topics: Health systems. Available at: <http://who.int>  
Retrieved: (2014).