Full Length Research Paper

Framework for overcoming barriers of complementary and alternative medicine acceptance into conventional healthcare system

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Health disparities have been widely recognized as a problem throughout the world. This paper provided a strengthened collaborative virtual framework for overcoming barriers towards **accepting complementary and alternative medical practice into conventional healthcare system. Quantitative and qualitative data were gathered with semi-structured questionnaires and interviews from General Practitioners (GPs) with Complementary and Alternative Medicine (CAM) knowledge, CAM Practitioners with biomedicine knowledge, CAM patients, and scholars. 2,760 semi-structured questionnaires exploring knowledge, attitudes, and skills' barriers to integrative medical collaboration efforts were administered. Focus group discussions were held interviewing GPs, CAM practitioners, and others claiming effective prescriptions. Practitioners' team meetings, retreats, interaction, and prescription operations were observed. In this study, a videoconferencing-based healthcare services delivery system was developed and implemented for seamless exchange of healthcare information. 2,591 (93.5%) questionnaires representing 657 physicians (23.80%), 997 CAM practitioners (36.12%), 855 patients (30.98%), and 82 healthcare researchers (2.97%) responded, while 169 (6.12%) declined response. Fifty-two percent of the 657 GPs still referred patients for CAM treatments. Patients found complementary approaches more aligned with "their own values, beliefs, and philosophical orientations". Non-medical acceptance of CAM (43.27%) continued impeding CAM growth in Nigeria. CAM practitioners require evidence-based knowledge towards finding solutions and suggestions for seamlessly integrating CAM with modern healthcare practices.**

Key words: Collaboration, complementary and alternative medicine, integrated delivery system, videoconferencing.

INTRODUCTION

Healthcare can broadly be divided into modern (conventional, orthodox, western or allopathic) and traditional (indigenous, complementary, alternative or integrative) groups. Medical pluralism depicted in Figure 1 is an ongoing process that results from complex historical, socio-cultural, and political economic forces that include: public demand, individual choice, competing medical systems, and socio-cultural needs (Kadetz, 2009).

Biomedicine

In modern medicine, knowledge expansion is achieved through scientific research, which can involve global collaboration and commitment (Xue, 2008). Modern system of medicine is based on sound experimental data, toxicity studies and human clinical studies. In the case of herbal medicine, the pharmacopoeia on herbal products is usually not available, though standardization, quality
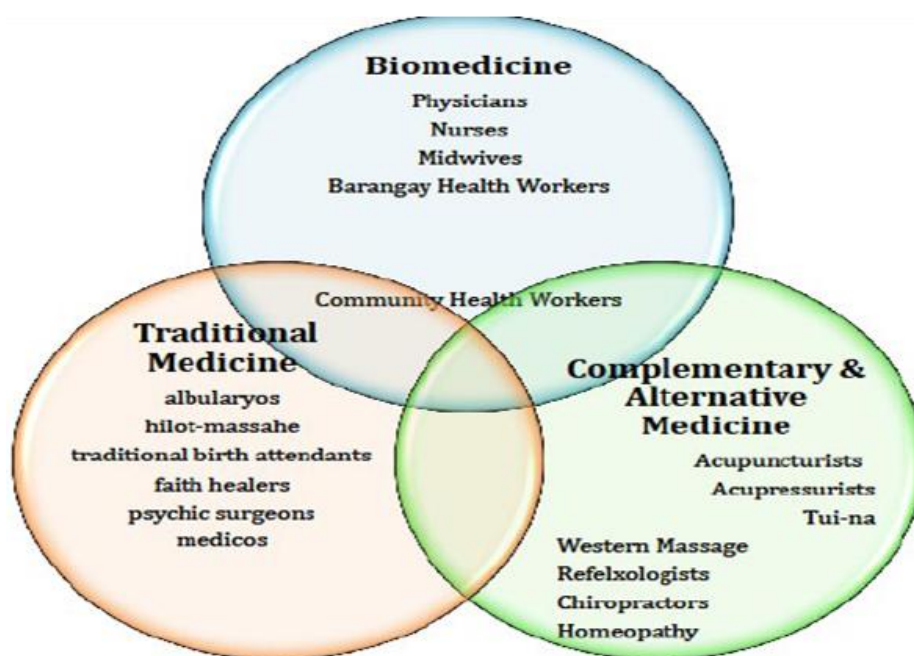
Figure 1. Medical Pluralism: The Formal and Informal Healthcare Systems (Kadetz, 2009).

control parameters for the raw materials as well as finished products are virtually non-existent, and herbal industry lacks good manufacturing practices (de Silva and Bahorun, 2009).

Traditional Medicine (TM)

Traditional medicine is defined by the World Health Organization (WHO) as the sum total of all knowledge and practices, whether explicable or not, used in diagnosing, preventing and eliminating physical, mental or societal imbalances. Traditional medicine mainly depends on prevention of illnesses and development of natural resistance to diseases, and thus believes in promotion of general well-being (Dama et al., 2010).

Traditional medicine based on herbal remedies has always played a key role in the health systems of many countries (Verma *et al.* 2007). Due to poverty, ignorance and unavailability of modern health facilities, most people especially rural people are still forced to practice traditional medicines for their common day ailments, as such, most of these people form the poorest link in the trade of medicinal plants (Ogbole et al., 2010).

Complementary and Alternative Medicine (CAM)

CAM, as defined by the National Center for Complementary and Alternative Medicine (NCCAM), is a group of diverse medical and health care systems, practices and products that are not presently considered part of conventional medicine. CAM involves the use of

various modalities in a variety of domains (Figure 2) to relieve symptoms and treat various diseases. NCCAM, a part of the National Institutes of Health (NIH), designates five major domains of complementary and alternative medical practices: (1) alternative medical systems, (2)

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Abbreviations: AGPMP: Association of General and Private Medical Practitioners, **BTMP:** Boards of Traditional Medicine Practitioners, **CHPA:** Community Health Practitioner Association, **ICT:** Information and Communications Technology, **HL7:** Health Level 7, **HMB:** Hospitals Management Boards, **MDCN:** Medical and Dental Council of Nigeria, **MySQL:** Microsoft Structured Query Language, **NAFDAC:** National Agency for Food, Drug Administration and Control, **NANNM:** National Association of Nigerian Nurses and Midwives, **NCC:** Nigeria Communications Commission, **NCCAM:** National Center for Complementary and Alternative Medicine, **NCN:** Nursing Council of Nigeria, **NIH:** National Institutes of Health, **NMA:** Nigerian Medical Association, **NNMDA:** Nigeria Natural Medicine Development Agency, **NRDN:** National Resident Doctors of Nigeria, **OTC:** Over the Counter, **PHP:** Hypertext Preprocessor Programming Language, **PSN:** Pharmaceutical Society of Nigeria, **UML:** Unified Modelling Language, **WHO:** World Health Organization.
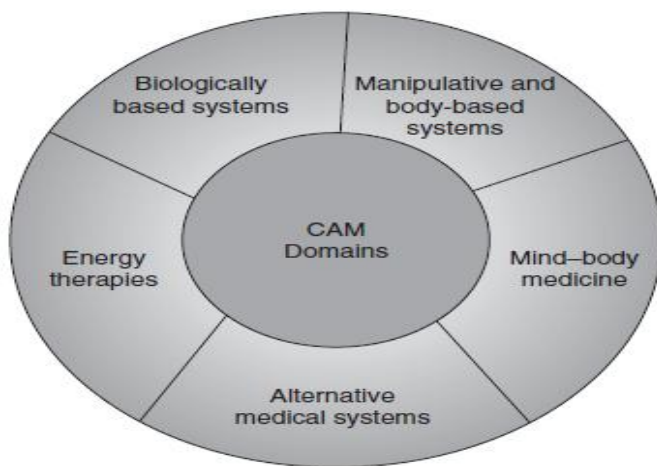
Figure 2. CAM Domains (Heimall and Bielory, 2008; Wisneski and Anderson, 2009; Kelvin and Tyson, 2011).

mind-body interventions, (3) biologically based treatments, (4) manipulative and body-based methods, and (5) energy therapies. Each of these categories comprises numerous individual systems and treatments for which the NIH provides research support (Heimall and Bielory, 2008; Wisneski and Anderson, 2009; Kelvin and Tyson, 2011).

With some overlap across categories, the five domains in Figure 2 have been summarised by Petrie (2008) as follows:

1. Biologically based practices: This domain uses substances found in nature, such as herbs, special diets, or vitamins (in doses outside those used in conventional medicine).
2. Energy medicine: It involves the use of energy fields, such as magnetic fields or biofields (energy fields that some believe surround and penetrate the human body).
3. Manipulative and body-based practices: They are based on manipulation or movement of one or more body parts.
4. Mind-body medicine: It uses a variety of techniques designed to enhance the mind's ability to affect bodily function and symptoms.
5. Alternative medical systems: They are built on complete systems of theory and practice. Often, these systems have evolved apart from and earlier than the conventional medical approach used in the United States.

Healthcare Information Systems (HCISs)

Healthcare Information Systems (HCISs) have been defined as powerful ICT-based tools able to make health care delivery more effective and efficient (Locatelli et al., 2012). Most developed countries are facing important

overall problems regarding healthcare services, such as: increased demand of healthcare due to an increased number of elderly and changed life styles leading to an increase in chronic diseases; demand for increased accessibility of care outside hospitals, moving health services into the patient's own homes; need for increased efficiency, individualization and equity of quality-oriented healthcare with limited financial resources; difficulties of recruiting and retaining personnel in the healthcare services in general and in home and elderly care in particular. These challenges turn home healthcare into one of the fastest growing areas of healthcare provision. To decrease costs, there is on the one hand a trend for centralisation of specialist care in form of fewer but more specialised clinics, and on the other hand, healthcare is decentralised, leading to a shift from in-hospital care to more advanced home healthcare. Furthermore, increasing interest from individuals in self-managing their health and a preference for aging at home rather than in an institution are other driving forces. The rapid development of information and communication technologies (ICT) runs parallel to these societal changes and offers the possibilities to cope with the above-mentioned challenges (Sabine, 2005).

Patient-centered collaborative healthcare delivery network architecture

A patient is a person/individual in need of healthcare services delivery to be provided by General Practitioners (GPs) or Complementary and Alternative Medicine (CAM) practitioners. The patient's encounter is part of the episode of care. At the core of any healthcare delivery system is the patient as depicted in Figure 3 where stakeholders, incorporating trado-medical authorities among others, are in a collaborative healthcare delivery network. The model is grounded in the client-centred psychotherapy model which refers to a philosophy of care that aims at the best collaboration possible of the patient's perspective. The patient's needs and priorities for care are at the core of care provision. Patients' requirements for healthcare include treatment and care that work, good relationship with practitioner, provision of information, and remaining in control of treatment (Omogbadegun et al., 2011).

A major challenge for healthcare is how to provide improved services to an increasing number of people using limited financial and human resources (Varshney, 2006). The healthcare's aim is to achieve the best health outcomes in the most efficient manner, and the challenge for today's health delivery systems is to increase productivity and quality of care without increasing the economic costs (de Leiva et al., 2008). Health disparities have been widely recognized as a problem throughout the world. The frequency of non-optimal patient care, the wide variations in practice, and the inefficiencies,
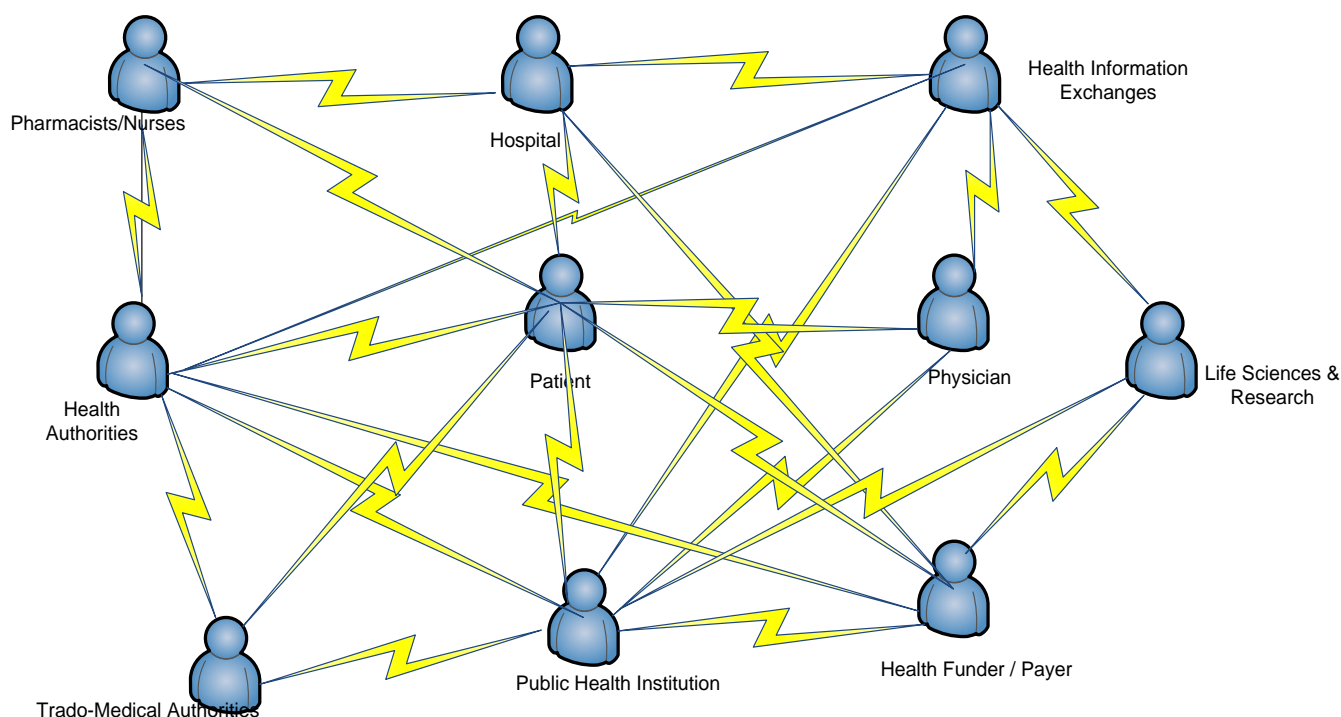
Figure 3. Patient-centered collaborative healthcare delivery network architecture.

dangers, and inequalities have been reported in literature (Omogbadegun et al., 2011). Information and Communications Technologies (ICTs) are needed in addressing the global challenges of healthcare worldwide. Vast arrays of natural healing modalities - both ancient and new - have emerged, and some are even challenging orthodox medicine for part of the middle ground (Pengelly, 2004). The truth is that modern medicine is desperately short of new treatments. It takes years for a new drug to get through the research and development pipeline to manufacture and the cost is enormous. Growing drug resistance, in part caused by the misuse of medications, has rendered several antibiotics and other life-saving drugs useless. Both of these trends mean that scientists and pharmaceutical companies are urgently looking for new drug sources and are increasingly turning their eyes to CAM (Shetty, 2010).

Medicinal and Aromatic Plants (MAPs) are increasingly recognized worldwide as an alternative source of efficacious and inexpensive medications to synthetic chemo-therapeutic compound. Medicinal plants are used in treatment and prevention of various health problems from simple to complex disease situations among rural populations globally, thereby improving the quality of life (Elufioye et al., 2012). Different societies of the world use the MAPs according to their own beliefs and knowledge and previous experiences. Their knowledge about the use of the MAPs is usually not known to the other world

societies or scientists. These hidden areas need to be explored (Abbasi et al., 2012).

Man has used drugs for various purposes from the dawn of history. Herbal and other plant derived remedies have been estimated by the World Health Organization (WHO) to be the most frequently used therapies worldwide. Plant-derived remedies can contain chemicals with potent pharmacologic and toxicologic properties. It is a common knowledge that there are not enough 'doctors and pharmacists' in Africa and other developing countries to direct and guide everyone who become ill on the correct use of medications. Drug manufacturers have not helped matters as their chief concern is to promote the sale of their medicines without giving adequate information to the public on such drug if possible in the local language. This is compounded by high illiteracy level, poverty and inadequate health facilities and personnel. Self medication offers a way out as people begin to sense the positive benefits of multiplying their options in health care. In the developed countries with sufficient health manpower, many people still buy non-dangerous medications without a doctor's prescription. These are the over-the-counter (OTC) drugs whose sales statistics reflect the pattern of self medication (Afolabi, 2012).

Patients are demanding less aggressive forms of therapy, and they are especially leery of the toxicity of pharmaceutical drugs. CAM therapies are used in an

effort to prevent illness, reduce stress, prevent or reduce side effects and symptoms, or control or cure disease. Conventional physicians are unable to appreciate the imperative of CAM in collaborative healthcare delivery due to paucity of their knowledge of CAM's underlying epistemology and methodologies. In Nigeria herbal practices, the practitioners claim that plant parts possess various phytochemicals which exhibit diverse pharmacological and biological responses and diversities. Nigeria is a country stepped in the use of and belief in traditional medicines in which plants play a major role. The low accessibility or inaccessibility and non-affordability of modern drugs among the rural populations of tropical Africa have made a large proportion of rural people depend on traditional herbal drugs in order to be healthy and economically productive (Idu and Onyibe, 2007; Kayode and Ogunleye, 2008; Ekanem and Udoh, 2010; Oladele et al., 2011; Omogbadegun et al., 2011; Elufioye et al., 2012).

Collaborative and multidisciplinary health care

Health seeking "behaviour" has always been integrated, as people choose the approaches they feel help to improve their symptoms, heal their illness, preserve their health and prevent ill health. The concept of collaborative health (CH) encapsulates the physical, psychological and social health resources the individual uses in teamwork; resources which at the same time are influenced by the teamwork (Sandberg, 2010).

   Collaborative health care entails physicians and other health care service providers using complementary skills, patients based on trust, respect and an understanding of each others' skills and knowledge. This involves a mutually agreed upon division of roles and responsibilities that may vary according to the nature of the practice, personalities and skill sets of the individuals. The relationship must be beneficial to the patient, the physician and other providers. Connecting healthcare services providers directly to patients who would otherwise be inaccessible due to distance or transportation using communication technologies based on synchronous (telephones and audio-video links) and asynchronous (e-mail) modalities has been a major objective. Patients preferred synchronous communication mechanisms such as videoconferencing sessions with the counsellors to detailing their problem to the kiosk owner who relays the information via e-mail along with a picture. Multidisciplinary care constitutes a team approach to the provision of care by all relevant medical and allied health professionals, with specific reference to the collaborative development of an individual treatment plan for each patient (communication at its core). The key objective of any collaborative virtual healthcare system equipped with modern technology is to increase access to essential healthcare services, especially for rural and underserved populations (Jia and Zhou, 2005).

Collaborative virtual environments

Collaborative Virtual Environments (CVEs) involve several participants working in a network, using a shared virtual environment to analyze the same object from different points of view, and in which the action of any participant is viewed by all others sharing the environment. In order to make communications more realistic, the environment must supply voice, video and data multimedia applications. This will favour comprehension of the actual intent of each participant, thus improving the collaborative environment. Networked computers and corresponding applications facilitate collaboration activities through a constellation of various tools (such as shared spaces, whiteboards, etc.) having appropriate approaches to collaboration and social interactions. In a multimedia environment, different types of traffic (video, voice, data, etc.) compete for the use of the same resources. High performance computing and networking technology promise to offer great potential to link many medical centers and universities to each other (Rodrigues and Filho, 2009). Most of the problems related to CVEs involve communication support, which should allow any update to the interface to be quickly noticed by other users. A major problem that needs to be addressed in using virtual environments as a means of computer mediated communication are the problems of coping with inconsistencies due to network delays in collaborative virtual environments. A Collaborative Virtual Healthcare System (CVHCS) features a network for CVEs with concurrent healthcare processes and practices as the nucleus that is built on open healthcare information infrastructure to support any technology in a heterogeneous healthcare domain. A significant issue in health related applications is protecting a patient's profile data from unauthorized access. A very important element of virtual communities is trust. Trust should be built upon the same specifications for secure data transfer and levelled access with medical information (Apostolakis et al., 2008). Computer technology such as virtual environment provides virtual spaces that can be crafted to support collaborative work and social interplay. To successfully bridge the gap between knowledge and policy/practice, research must be holistic and relevant. It must provide workable solutions that can be integrated into health systems and/or professional practice models, eventually becoming embedded into everyday processes (Armstrong, 2008).

   This research provides a framework for collaborative virtual complementary and alternative healthcare systems based on enabling ubiquitous computing, ubiquitous communication, and intelligent user-friendly interfaces technologies in integrating healthcare services providers. This entails the convergence of information technologies

into a networked computing environment that is always on and available in unobtrusive ways.

Collaborative virtual complementary and alternative healthcare systems

Collaborative virtual complementary and alternative healthcare systems' success depends on enabling ubiquitous computing, ubiquitous communication, and intelligent user-friendly interfaces technologies towards integrative healthcare systems. Strengthening the technical capacities and collaboration among practitioners of traditional medicine to further strengthen and improve CAM infrastructure will be rewarding. This will foster greater information exchange towards improving and increasing the understanding, dissemination, and use of CAM for healthier nation where over 51% of the population residing in the rural and underserved areas rely on CAM interventions for their health needs.

By bringing together in real time the competencies, experience and judgment of a variety of professionals, organizations are trying to respond to a reality that is becoming increasingly complex in terms of both the knowledge and the working methods that are being applied. Successful collaboration in health care teams can be attributed to numerous elements, including processes at work in interpersonal relationships within the team (the interactional determinants), conditions within the organization (the organizational determinants), and the organization's environment (the systemic determinants) (Marti´n-Rodriguez et al., 2005).

An integrative health care approach should allow the combination of the best of traditional and complementary medicine with the best of conventional medicine. Complementary and alternative medicine (CAM) tends to include those healthcare approaches not commonly accepted as part of conventional medicine, and access and costs vary between countries. There is often little or no communication between patients and their conventional doctors regarding their CAM use. To ensure delivery of the best possible patient-oriented health care, communication is critical. Integrative medicine has been described as the "deliberate integration of all aspects of medicine into a coherent delivery of all medical care and therapeutic approaches by maintaining a focus on the whole person" (Robinson, 2011).

Healthcare services in Nigeria

A shortage of almost 4.3 million doctors, midwives, nurses and support workers worldwide is most severe in the poorest countries, especially in sub-Saharan Africa, where they are most needed (WHO, 2006). In recent years, there has been a substantial reduction in the availability of health professionals in developing countries, which has been accompanied by a rise in the demand for high-quality health care. This combination has forced health care institutions to collaborate and share their resources to provide comprehensive, high-quality and accessible health care at a reasonable cost (Wootton et al., 2009).

The Nigerian health system's stakeholders

In sub-Saharan Africa, a region that has 25% of the world's burden of diseases, 1.3% of all healthcare workers in the world are treating 13.8% of the world's citizens. Nigeria is a country situated on the West African coast. With a population of 140 million people in 2006, structured into a broad-based population pyramid in which 71.7 million are male and 68.2 million are female, Nigeria is regarded as the most populous nation in Africa. Health services are provided following a three-tiered structure of tertiary, secondary and primary health-care facilities under various arrangements as follows:

- Government-funded public hospitals.
- Privately funded for-profit hospitals.
- Donor-funded, faith-based, not-for-profit health facilities.
- Donor-funded, non-faith-based health facilities (for example, reproductive-health clinics).
- Public-private partnerships under the National Health Insurance Scheme.
- Traditional health facilities.

Various professional and regulatory associations are also involved in health service delivery through training, accreditation and certification of professionals. They include the Medical and Dental Council of Nigeria, Nigerian Medical Association, Association of General and Private Medical Practitioners, National Association of Nigerian Nurses and Midwives, Nursing Council of Nigeria, Community Health Practitioner Association and Pharmaceutical Society of Nigeria. Government agencies involved in regulatory and oversight functions include the National Agency for Food, Drug Administration and Control (NAFDAC) (Odubanjo et al., 2009).

Stakeholders involved in the Nigerian Health System include Public Sector Players (Ministries, Departments, and Agencies), Non-Public Sector Players (Private for Profit Sector, Private not-for-profit organizations – Charities, Religious groups, etc), and NGOs (International and Local, and External Partners/ Development Partners). Collaboration with the various tiers of government and all sectors involved in the provision of health services should be a priority issue and of primary concern to all stakeholders. Such efforts at inter-sectoral collaboration should encompass activities which include formal and informal linkages with other ministries, departments, agencies, development partners and health care providers; cooperation and collaboration

in implementing specific interventions; formal sharing of care between and across health disciplines, acute and community-based care settings (Azodoh, 2009).

Documentary evidence has shown that health service delivery in Nigeria is as low as 30% and other indicators such as waiting times, staff attitude to work and public confidence in the health sector has declined significantly over the years (Ibrahim, 2009). The challenge of Nigeria's healthcare delivery systems is providing improved services to an increasing number of people using limited financial and human resources. Patients in Nigeria's rural areas (where over 51% of the population reside) lack access to healthcare facilities (HCFs) and human resources (Onwudiegwu and Awowole, 2012). Nigeria has 20 as against 23 doctors, nurses and midwives per 10,000 population (WHO, 2010), a doctor-patient ratio of more than 4,000 as against 1 to 40 in Europe (Bankole et al., 2009; Osibogun, 2012).

Objective

The main objective of this study is to provide a platform for a multidisciplinary team of scholars, healthcare services providers, and CAM practitioners for seamless information exchange in African healing process. Barriers impeding acceptance of CAM into conventional healthcare delivery system needed to be identified and overcome, using Nigeria as case study. A paradigmatic approach to CAM integration could create a common basis for scientific dialogue, encourage exchanges between medical communities, and establish policies for the development of a true multidisciplinary health care cooperative that is consistent with the current public health model (Giordano et al., 2003).

Driven by consumer demand, integrating conventional and CAM practices has gained popularity. The lack of disclosure by patients of their CAM use to their physicians and the potential impact on health (for example, drug interactions) is a primary reason for the integration of conventional and CAM therapies at the primary care level. Other motivators include the hopes of improved health care outcomes and cost-effectiveness, for both the initial cost of treatment as well as the long-term cost to the health care system. This is supported by some evidence that CAM therapies are effective in treating chronic pain or disease, typically high cost conditions (Suter et al., 2007).

Current trends favour enhanced cooperation among various healthcare services providers and the integration of CAM therapies into conventional medical treatments. However, the reality is that it is difficult for any one conventional or CAM practitioner to comprehensively learn the nuances of other disciplines. In recent years, the use of CAM has exploded, with adult usage as high as 62% and paediatric usage ranging from estimates of 10 to 15% to as high as 40%. However, researchers have

also suggested that merging concepts and practices from local medicinal knowledge and Western science have the potential to improve public health and support medical independence of local people (Calvet-Mir et al., 2008).

Despite the increasing integration of complementary and alternative therapies into the mainstream health care system, there is still confusion surrounding the terms and extent of such acceptance. General physicians with a biomedical focus have remained the dominant professional group in integrative healthcare settings. CAM practitioners are generally excluded from patient charting; prohibited from ordering diagnostic tests; and not allowed to refer patients to biomedical physicians. Conventional physicians misappropriated CAM modalities or excluded CAM practitioners from group rounds. Many CAM practitioners are also disadvantaged because they do not understand biomedical language which dominates group meetings and patients' charts. Despite growing interest among physicians for CAM therapies, they lack understanding of CAM and have little awareness that their patients seek CAM providers (Mior et al., 2010).

MATERIALS AND METHODS

Research efforts in Western countries have been largely concerned with the interrelated issues of quality, safety and efficacy of only certain forms of CAM, especially biological-based form. Six urban cities and six villages in three of the six South-Western States of Nigeria where both conventional medical and CAM practices aggressively compete for the centre were selected for this study from January 2010 through June 2012, and they are as follows: "Akure", Supare-Akoko, Oba-Akoko, Idanre, "Ondo" and "Owo" (Ondo State; 2006 census = 3,460,877); "Abeokuta", "Ijebu-Ode" and Ota (Ogun State; 2006 census = 3,751,140); and Agege, Mushin, Oyingbo, "Lagos" (Lagos State; 2006 census = 9,113,605) of Nigeria.

"Ondo State" (3,460,877 clients, 2.46%) has 18 LGAs, 808 health institutions (Primary: 458 public, and 308 private; Secondary: 19 public, and 21 private; and Tertiary: 2 public, and 0 private) consisting of 166 hospitals (Federal and State), 391 health centres (41 comprehensive health centres and 350 basic health centres), 126 clinics, 33 maternity centres and homes, 92 other HCFs; 111 medical officers, 767 nurses/midwives, 37 pharmacists unevenly distributed in the 18 LGAs (FMOH_DPRS_ONDO, 2012).

"Ogun State" has a total of 60 medical doctors providing healthcare services in the supported facilities in the State. Of this number, 32 medical officers (53.3%), 10 specialists (Obstetrics and Gynaecology) accounted for 16.7% and 18 non-specialist doctors (30.0%). Almost two-third of the doctors (65.0%) worked in Teaching Hospitals. Another 31.7% worked in the General Hospitals (GHs), and only 3.3% provided healthcare

services in the Primary Facilities. Also, 81.7% of the doctors were in urban facilities compared to 18.3% in the rural facilities (UNFPA, 2010). Presently in "Ogun State", the ratio of 60 doctors to 4 million populations is grossly inadequate (Amosun, 2011). With a total of more than 15 traditional birth attendants, Latwa Hospital in Latwa Community in Sagamu of Ogun State has no delivery facility, but a room and a parlour as at November 20, 2012 (Ameh, 2012).

"Lagos State" had a total of 269 medical doctors and 4,102 registered traditional practitioners providing healthcare services. Of this number, 201 medical officers (91.8%), 19 specialists (Obstetrics and Gynaecology) accounted for 7.1% and 31 non-specialist doctors (11.5%). Most of the medical doctors (92.6%) worked in urban areas as compared to only 7.4% in the rural areas. Also, 57.6% worked in the secondary facilities against 42.3% that provided healthcare services in the primary facilities. Of the 327 skilled health workers, 75.8% were nurse/midwives, 18.4% were doctors, 2.1% each were nurses and midwives respectively, while nurse anaesthetists accounted for 1.5%. Their distribution by types of facilities indicated that 63.0% were in GHs (secondary facilities), 20.8% were in primary facilities, while 16.2% were in the teaching hospitals. In terms of residence, 79.2% were in urban-based facilities compared to 20.8% in rural-based facilities. In fact, all the obstetrics and gynaecology specialists and nurse anaesthetists were deployed to urban areas. The 28 supported facilities in the State had a total of 746 health workers. Out of this total, 516 (69.2%) were in urban facilities compared to 230 (30.8%) working in rural facilities. The distribution by the types of facilities indicated that 426 of them (57.1%) worked in GHs, while 267 (35.8%) were in the primary types of facilities. The balance of 53 workers (7.1%) was deployed in the tertiary facility or teaching hospital. In terms of the distribution by the types of health workers, registered nurse/midwives at 248 (33.2%) recorded the highest figure, followed by ward attendants with 171 (22.9%). Meanwhile, Community Health Officers recorded the number of 2 (0.3%). Further, the distribution according to professional cadre showed that nursing and midwifery professionals accounted for the highest at 43.9%, while laboratory staff recorded the least of 4.3%. Others were ward attendant at 22.9%, pharmaceutical personnel with 9.5%, medical doctors who accounted for 8.0%, community health workers with 7.5% and others with 11.9% (UNFPA, 2010a; LASMOH, 2012).

Questionnaire construction/refinement and survey administration was done after which focus group discussions were held. Quantitative and qualitative data were gathered with structured questionnaire and interview was conducted for collection of information on the barriers to integrative medicine collaboration efforts. Information gathering/requirements elicitation used

interview and questionnaire in order to determine the valid requirements for a collaborative virtual framework for CAM. We administered 2,760 semi-structured questionnaires to explore barriers on knowledge, attitudes, and skills to integrative medical collaboration efforts. Background variables of gender, age, education, experience, practice setting, cultural background, and time to interact were examined to determine if they influenced attitudes towards collaboration. The gathered data were analyzed using Statistical Package for Social Scientists (SPSS) 15.0 for Windows and Microsoft Excel 2007. GPs, CAM Practitioners, local medicine men or herbalists and others who claim to have effective prescriptions were interviewed. CAM practitioners' homes which are shown in Figure 4 for revitalization of Local Health Tradition (MAPs prescription and sales) were visited and operations were observed. Team meetings, retreats and interaction as well as hospital operations were observed. Cognate literature on the communication protocol between GPs and CAM Practitioners to ascertain impediment on collaboration efforts between the two classes of practitioners were consulted. A strategic plan to develop a virtual platform to engage patients and primary care providers online and through mobile devices was outlined. Protocol for communicating patient outcome goals across the entire care team was established. Synergy between remote physicians and nursing with home base was created.

Microsoft Visio, Unified Modeling Language (UML), and other software engineering tools were suitably used for modelling the behaviour of static aspects of the framework. The emerged video-conferenced software made use of Adobe Flash Media Server 4 provided by Adobe Corporation to serve as the streaming media server, and Adobe Flash was chosen to develop the video module ActionScript for the client software. WampServer (Window, Apache, ORACLE, and PHP Server) was the web server, while PHP code for the web module was developed with Adobe Dreamweaver. WampServer handled user management module and conference room management module. Oracle 11g Relational Database System held the tables used in conference functions module as the data source so that it could be integrated to other collaborative systems easily.

RESULTS

Out of the 2,760 semi-structured questionnaires, 526 general practitioners (gps) (19.06%), 31 doctor of osteopathy (1.12%), 65 specialist doctors (2.36%), 35 resident doctors (1.27%), (physicians put together = 657, that is, 23.80%), 997 CAM practitioners (36.12%), 855 patients (30.98%), and 82 healthcare researchers (2.97%) were interviewed. 169 questionnaires were returned with 'No answer' (6.12%) as shown in Figure 5.

Fifty-two percent of the 657 GPs still refer patients for

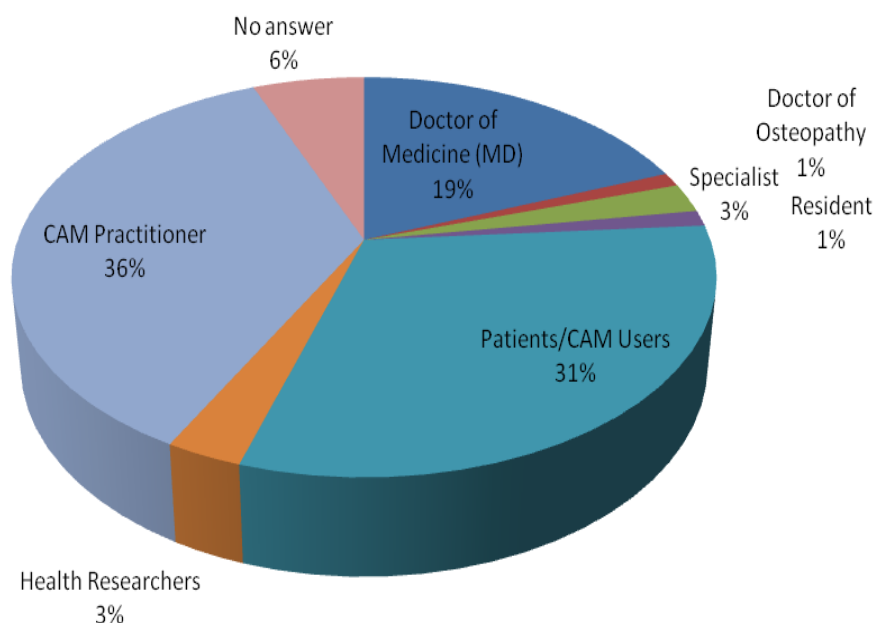**Figure 4.** CAM Practitioner Home, Ota, Nigeria.

Figure 5. Questionnaires respondents statistics.

CAM treatments. The main reason advanced for CAM choice was owner's personal choices (437/855, 51.11%) as shown in Figure 6.

This further confirms patients' dissatisfaction with conventional medications earlier reported. As shown in Figure 7, herbs (27%), prayers (21%), naturopathy (8%), music (7%), and pastoral counselling (6%) were the most CAM health services preferred by patients in Nigeria.

Figure 8 shows the most frequent ailments/diseases for which patients in Nigeria are treated with medicinal plants. Malaria fever (13%), followed by diabetes (10%), headaches (9%), and cancer (7%) ranked tops. Patients find complementary approaches to be more aligned with "their own values, beliefs, and philosophical orientations. Non-medical acceptance of CAM (43.27%) remains the most impediment to CAM growth in Nigeria.
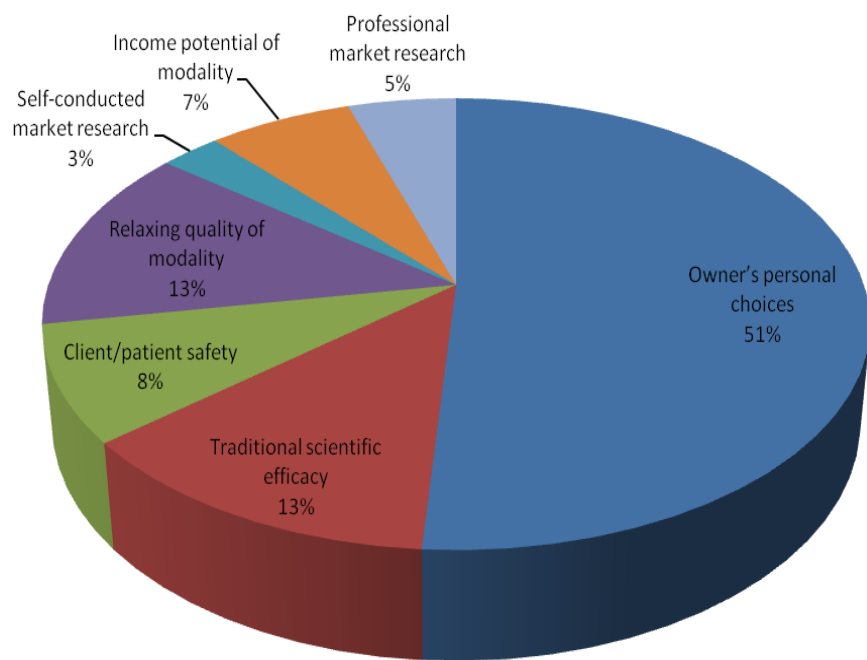
Figure 6. Main reasons for CAM choice.
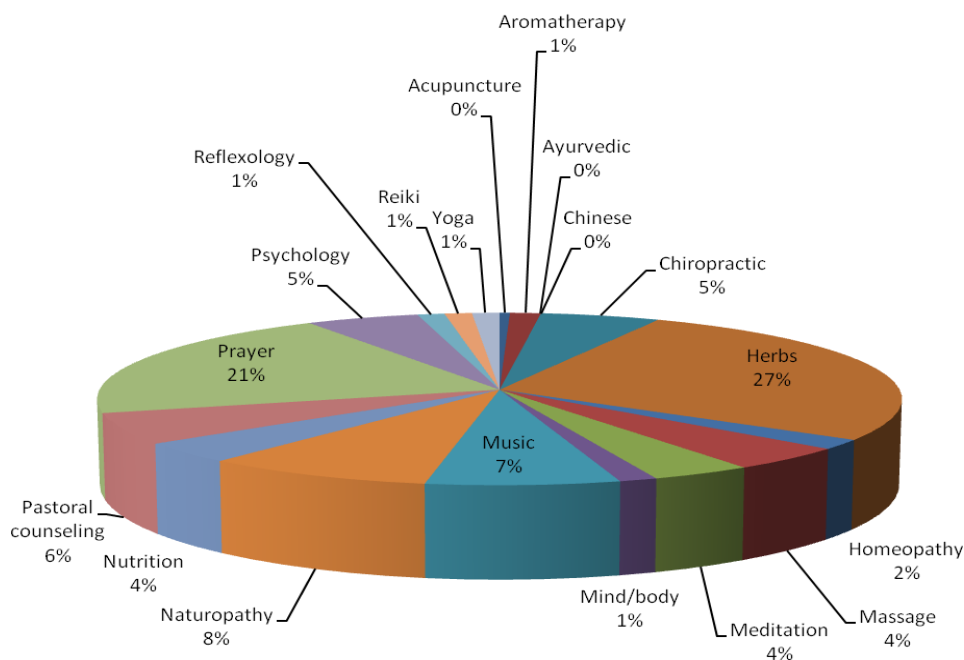
Figure 7. CAM health services preferred by patients in Nigeria.

Most of the clinics offer a variety of CAM treatments, including herbal and nutritional supplements, systematic systems of complementary medicine, and manual healing. Although some of its clinics are located in conventional primary and secondary care clinics, they operate independently, with their own administrative and
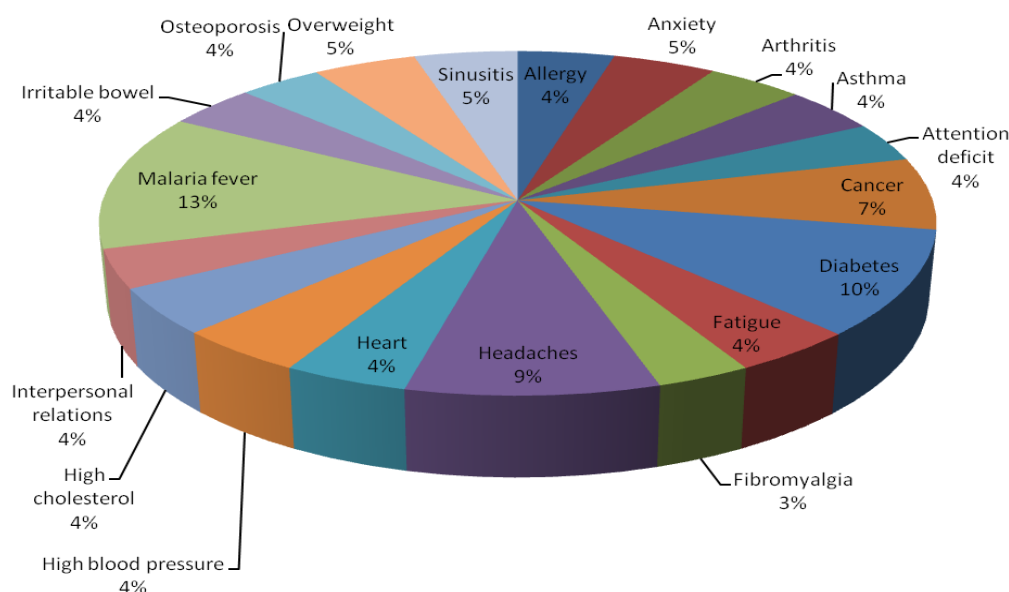
Figure 8. Frequent ailments / diseases treated for patients in Nigeria.
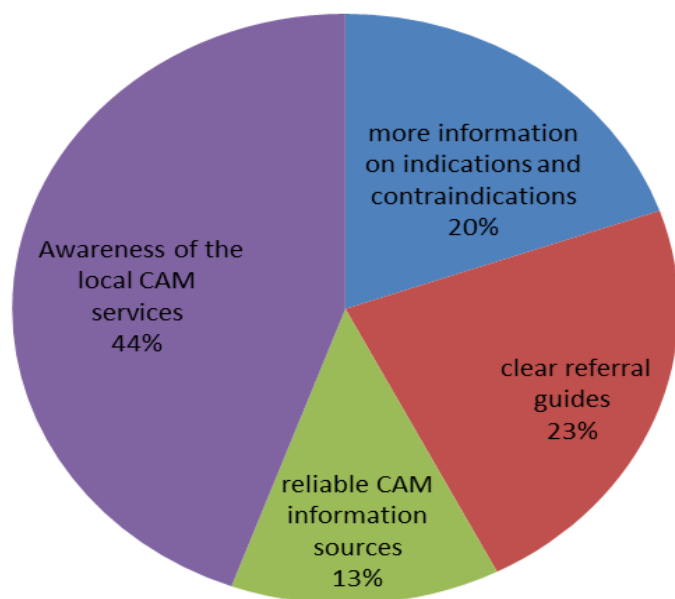
Figure 9. Family Physicians Knowledge of CAM.

clinical structures. In most cases, patients visit the CAM agencies without referral letters from their physicians. In general, no mechanism exists for the health maintenance organizations' CAM practitioners and conventional physicians to communicate or establish referral patterns and other professional peer relationships as shown in Figure 9.

The findings on communication protocol frictions between GPs and CAM Practitioners as shown in Figure 10 were still consistent with what had been reported in literature in Canada's case: General physicians with a biomedical focus remained the dominant professional group in integrative health care settings. CAM practitioners were generally excluded from patient charting; prohibited from ordering diagnostic tests; and not allowed to refer patients to biomedical physicians. Conventional physicians misappropriated CAM modalities or excluded CAM practitioners from group rounds. Many CAM practitioners were also disadvantaged because they didn't understand biomedical language which dominated group meetings and patients' charts.

The most impediment to CAM growth in Nigeria for integration into conventional medical practice is the medical acceptance of CAM (45/104, 43.27%) as shown in Figure 11 confirming the paucity of many biomedical physicians' knowledge of CAM's underlying epistemology and methodologies, thereby impeding the imperative of CAM in collaborative healthcare delivery.

The details on diseases treated with associated medicinal plants are among details to be exchanged among physicians, CAM practitioners, scholars, and researchers. This could be exchanged virtually since geographic distance, technology, lack of social presence, lack of adequate training and lack of instructional resources constitute just some of the unique challenges faced by virtual teams. The enhanced typical Healthcare Reference Model Architecture forms a basis for any health-system. A typical rural health care system lacks any planned integration. An aggregated collaborative
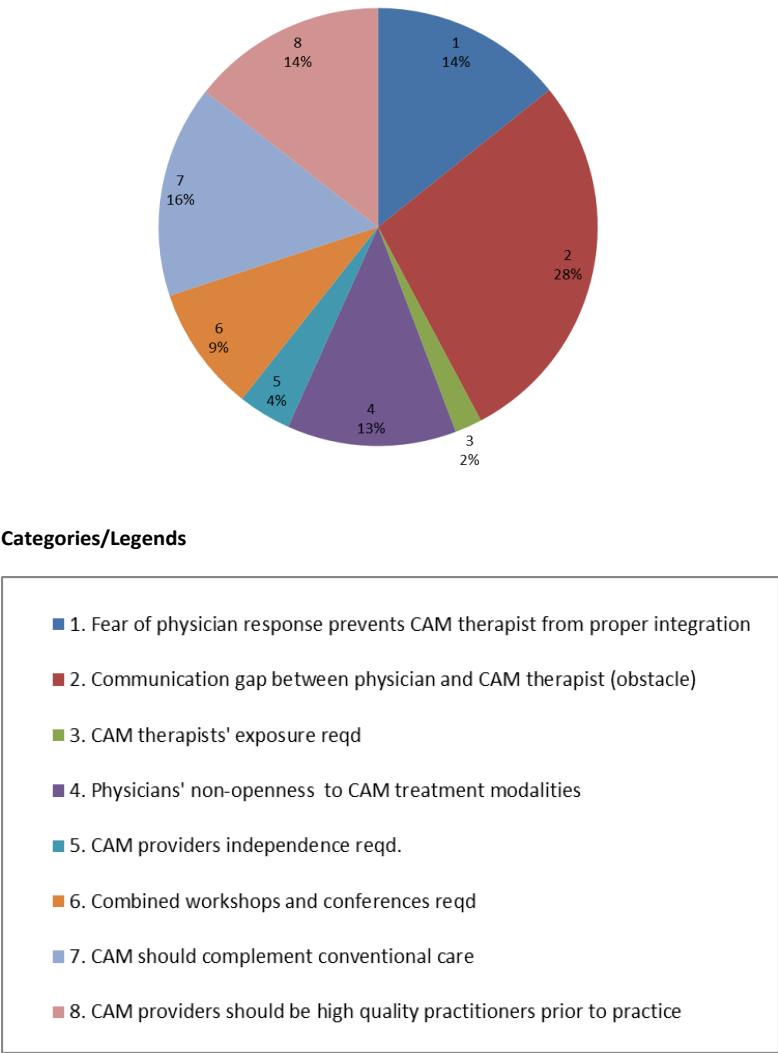
Categories/Legends

■ 1. Fear of physician response prevents CAM therapist from proper integration

■ 2. Communication gap between physician and CAM therapist (obstacle)

■ 3. CAM therapists' exposure reqd

■ 4. Physicians' non-openness to CAM treatment modalities

■ 5. CAM providers independence reqd.

■ 6. Combined workshops and conferences reqd

■ 7. CAM should complement conventional care

■ 8. CAM providers should be high quality practitioners prior to practice

Figure 10. GPs and CAM practitioners' attitudes.
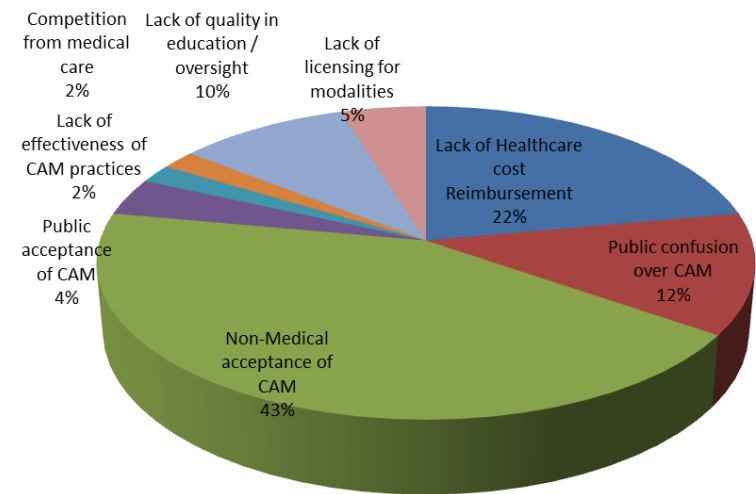
Figure 11. Impediments to CAM growth in Nigeria.
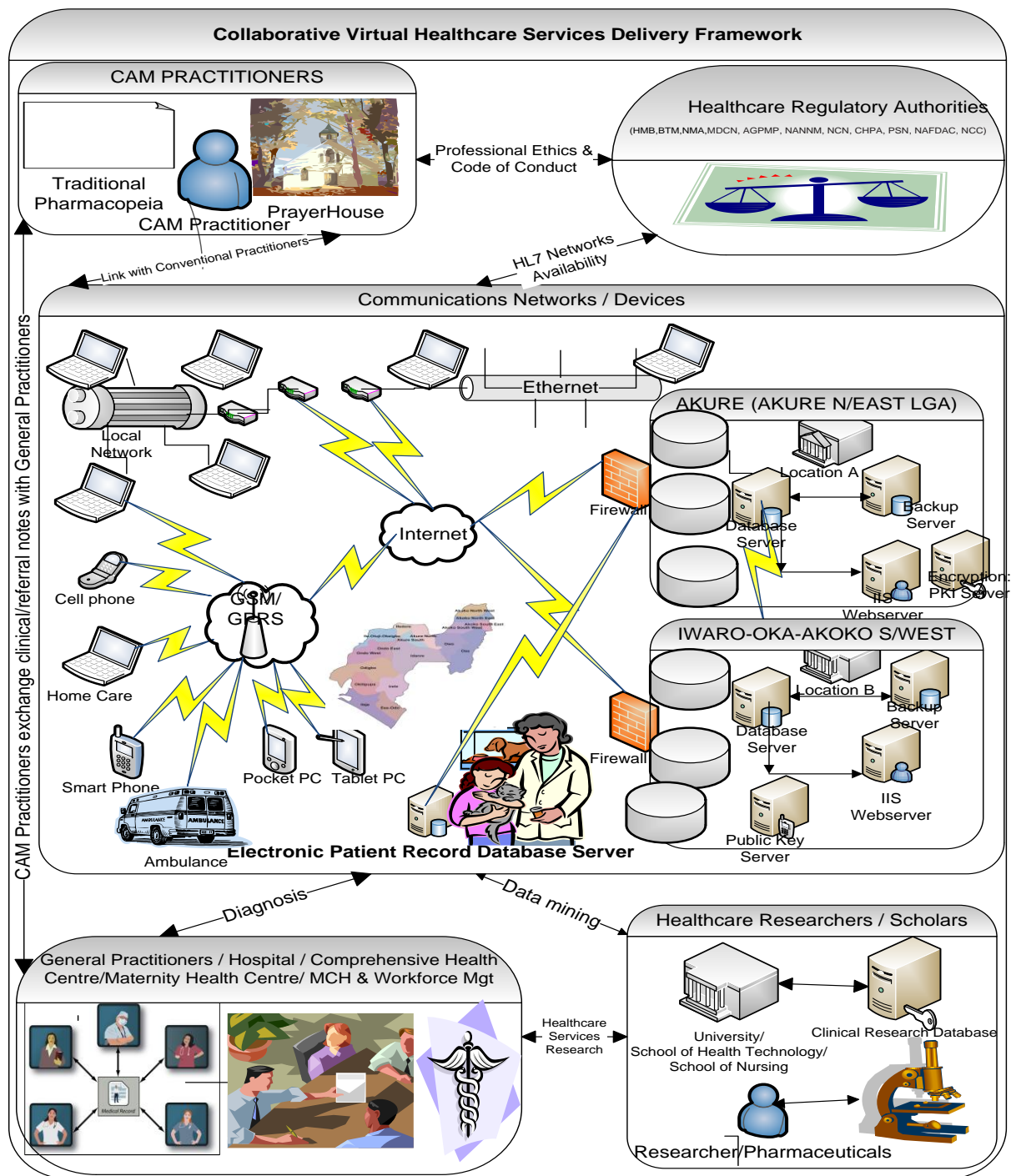
Figure 12. Aggregated collaborative virtual healthcare services delivery framework.

virtual healthcare services delivery framework for exchange of health delivery information among scholars, researchers, physicians, and CAM practitioners in a collaborative virtual manner developed in this paper is depicted in Figure 12.

Figure 12 shows typical collaborative virtual healthcare reference architecture for implementing an e-Health integration solution between two locations, say, Location A and Location B, in Nigeria. The Reference Architecture is centered round the use of the Connected Health

Services Hub, which enables the provision of a number of services including: collaboration services and communication services. The communication infrastructure (mobile telecommunication technologies) included bluetooth and wireless local area networks technologies. The device types used to collect medical data included Personal Digital Assistance (PDA), smart phones, or tablet PC. This framework exchanges health delivery information among physicians, CAM practitioners, scholars, and researchers in a collaborative virtual manner.

The aggregated collaborative virtual healthcare services delivery framework shows the communications infrastructure and the principal stakeholders including: (1) CAM Practitioners from Traditional Pharmacopedia, and Prayer Houses being facilitated to exchange clinical/referral notes with GPs via network. (2) Payers (Regulatory/Government/Patients) such as Hospitals Management Boards (HMB), Boards of Traditional Medicine Practitioners (BTMP), Nigeria Natural Medicine Development Agency (NNMDA), Nigerian Medical Association (NMA), National Resident Doctors of Nigeria (NRDN), National Agency for Food, Drug Administration and Control (NAFDAC), Nigeria Communications Commission (NCC), Medical and Dental Council of Nigeria (MDCN), Nigerian Medical Association (NMA), Association of General and Private Medical Practitioners (AGPMP), National Association of Nigerian Nurses and Midwives (NANNM), Nursing Council of Nigeria (NCN), Community Health Practitioner Association (CHPA) and Pharmaceutical Society of Nigeria (PSN) to ensure higher efficiencies and lower costs, standardization of care producing healthier (cheaper) patients, and better knowledge of outcomes. The regulatory bodies are also to ensure secured availability of Health Level 7 (HL7) networks and also ensure that harmful social or traditional practices do not interfere with access to appropriate medical treatment. (3) Patients demanding better healthcare, real choice, enhanced services, professional record keeping, and lower cost. (4) Doctors/Nurses/Hospitals/Labs' expectations are diagnosis with resultant higher efficiencies produced at lower costs (more value); focus on core competencies; and new, more lucrative, more rewarding roles. (5) Researchers/Pharmacy from universities, health institutions of learning, and pharmaceutical companies' drug research and development units are undertaking healthcare research activities in data mining, epidemiology, healthcare outcomes, drug development, drug interactions in the population, better targeted, faster, drug trials, and accessible historic record.

The implementations of this framework using the developed video-conferenced software depicted in Figures 13 to 16 are ongoing in a number of clinical and CAM settings in South west Nigeria. Figure 13 developed in this research demonstrates an internet-based virtual collaboration implementation (video-conferencing) in the identification and discussion of a medicinal plant between two practitioners at different geographical locations facilitating video streaming. This concept is applicable to patient care by replacing the medicinal plant with the patient. The number of participants or practitioners is unlimited as each of them is uniquely identified by the practicing licence number assigned by the regulatory authority to practise. Real time chatting facility has also been provided to send and receive texts.

Figure 14 shows that doctors/CAM practitioner, pastors, imams, researchers, and patients are primary users to collaborate. Each category of them has a database of qualified and registered persons from authorised associations. After successful login/registration, activities (including 'Enter Meeting') are open to the doctor/CAM practitioner.

After selecting, say 'Enter Meeting', the number of participants in the proposed discussion via video conferencing is done by clicking 'Two People' or 'Two-Four People' button on the menu bar in Figure 15. Once the connections have been done as advised above, the photo of each participant is visible to the others in the video conferencing session, and discussions continue (Figure 16).

DISCUSSION

The development of system architectures utilizing new computing technologies that support Collaborative Virtual Environments (CVEs) in CAM is a growing necessity just as continuity of care requires a cooperative environment among autonomous complementary medical departments in terms of data and functions. Strengthening and improving the CAM infrastructure to foster greater information exchange, improving and increasing the understanding, dissemination, and use of CAM will be rewarding. Providing secure, extensible, pervasive and easy to implement collaborative environment for medical applications poses significant challenge for state-of-the-art computer systems and networks.

It is expedient to increase access to essential healthcare services, especially for rural and underserved populations. Considering the physicians' overwhelming responses, we could establish the need to have more information on indications and contraindications of each CAM therapy; the need for clear referral guides; and the need for reliable CAM information sources. The physicians should be aware of the local CAM services available in their locality and develop familiarity with the quality of the local CAM providers as reflected in Figure 9. For a proper integration, the physicians expressed the need for their experiential exposure to CAM. Concern about lack of evidence that supports the use of CAM was not hidden from being expressed. It was agreed that combined interest groups of CAM practitioners and physicians could improve guideline application. However,
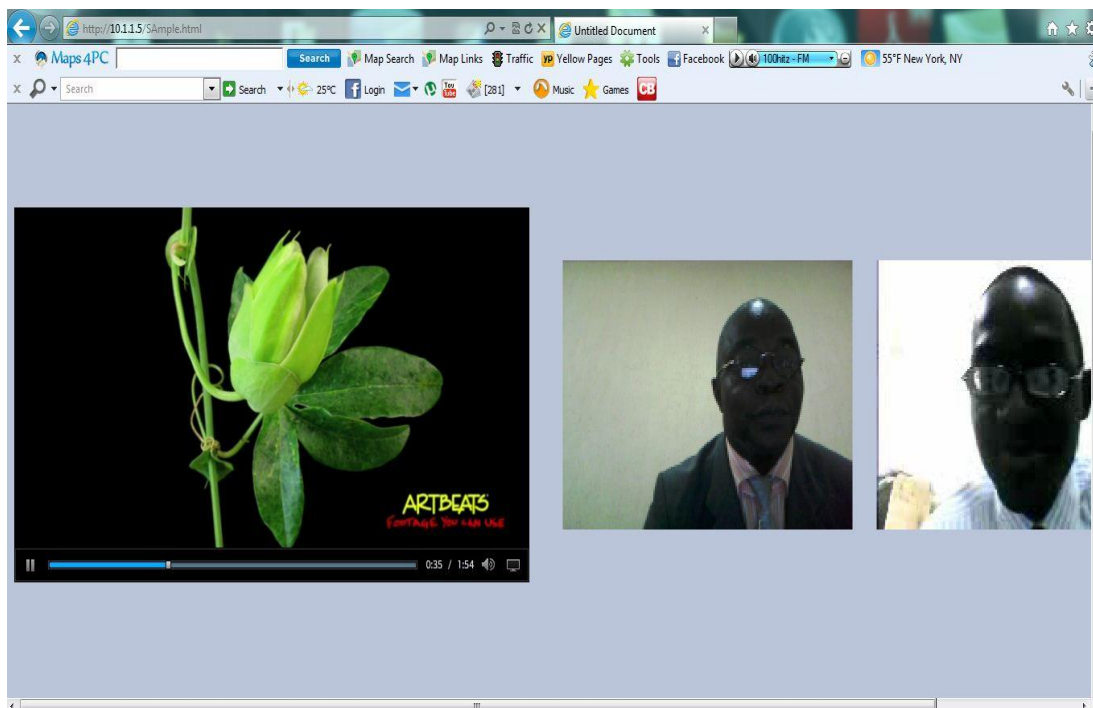
Figure 13. Collaborative virtual environment with video conferencing.

Figure 14. Doctors / CAM practitioner / Pastors/ Imams/ Researchers / Patients.

safety and efficacy remain the main issues to be addressed in the process of integrating CAM. In acquiring skills, the physicians expressed their willingness to have practical 'hands on' CAM instruction, so they could use it as another tool in providing health care.

On the CAM practitioners' side, it was expressed that physicians need to have courses in CAM prior to proper collaboration; also that CAM practitioners need to continue to expand their knowledge in conventional care. The attitudes of physicians, including fear of physician
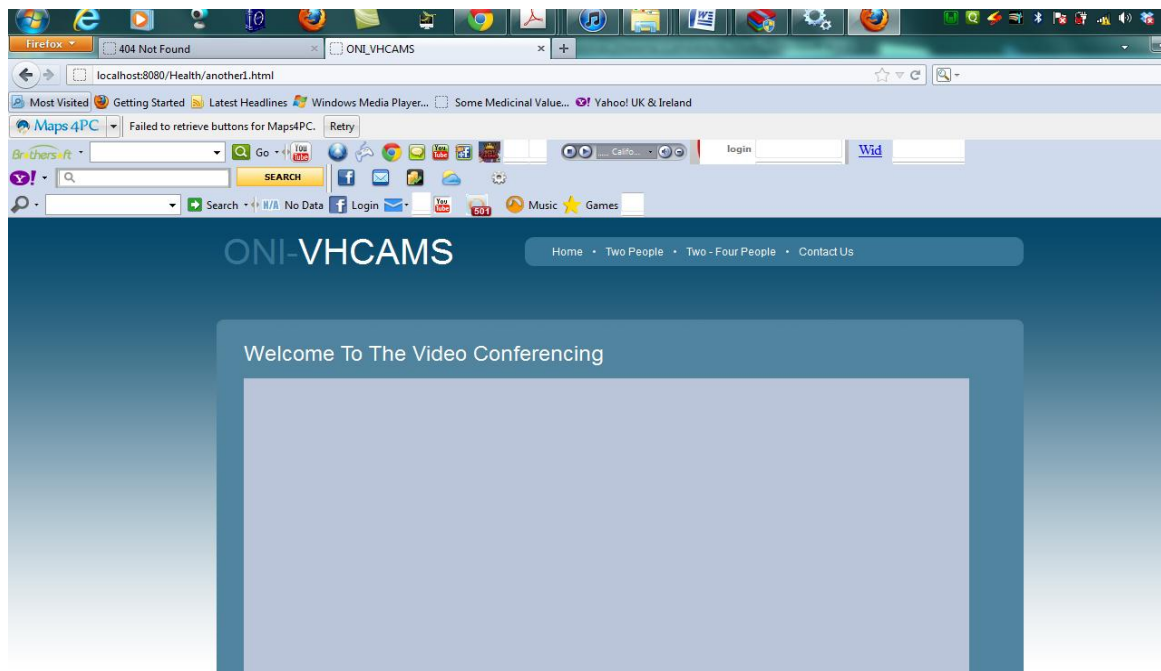
Figure 15. Video conferencing session among participants.
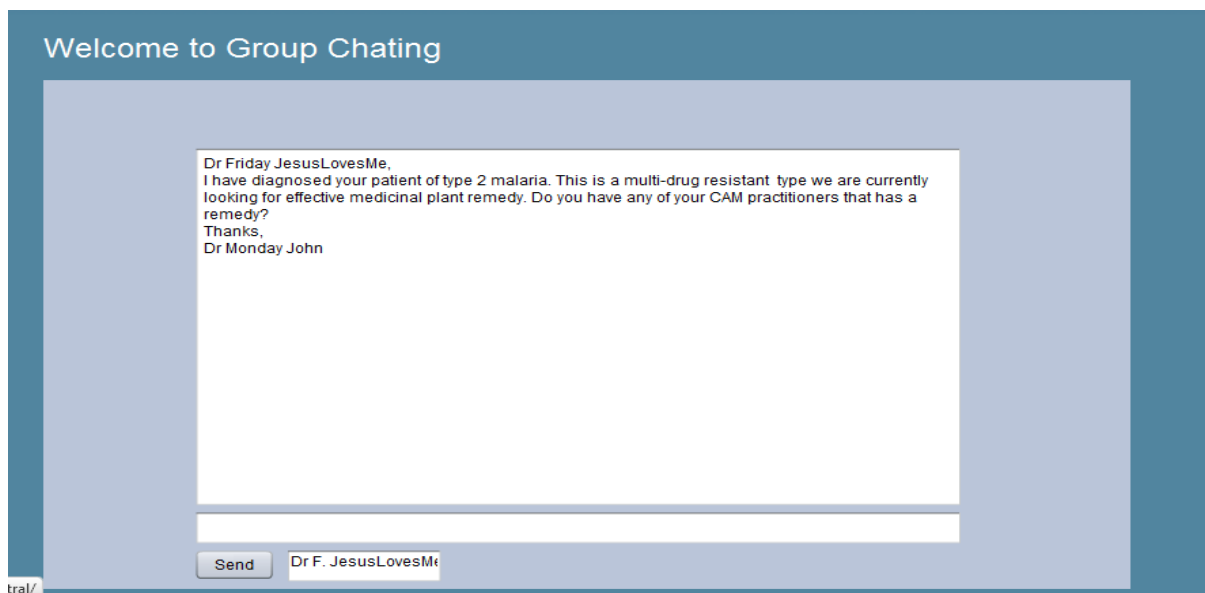
Figure 16. Group chatting session commenced.

response, prevent CAM therapist from proper collaboration. CAM therapists would need to be more exposed to conventional physicians' practices. Physicians also need to be open to different types of CAM treatment modalities. CAM providers at times should be independent and at times need the advice of the physician. There is a need for combined workshops and conferences that will address the issue of integrating CAM into conventional care. CAM should complement conventional care, and at times conventional care can support CAM by adding conventional tests. CAM providers would need to be high quality practitioners prior

to the collaboration in the conventional system. These are reflected in Figure 10.

Collaborative healthcare entailing physicians and other healthcare service providers using complementary skills, patients based on trust, respect and an understanding of each others' skills and knowledge has been established. This research also created a collaborative virtual environment for a multidisciplinary team of scholars and practitioners including computer scientists, information technologists, biochemists, biologists, chemists, ethnobotanists, phytochemists, phytopharmacists, physicians and African traditional doctors (typically herbalists) for information exchange seamlessly in African healing process. Videoconferencing provisions to facilitate the exchange of knowledge on either medicinal plants, patients or both among the stated users were made available via this work. These would promote scientific research towards obtaining clues and discovery of potential lead compounds and novel therapeutics from medicinal plants. Consequently, enhancing life expectancy of Africans through scientifically proven safe complementary and alternative medicine therapies would be realisable. CAM practitioners require evidence-based knowledge towards finding solutions and suggestions to seamlessly integrate CAM with modern healthcare practices. The resulting framework was centred on meeting the needs of the patient, promoting choice and their participation in clinical decision-making, and providing a common ground among the providers and patients that transcends the potential tensions from philosophical differences. The framework also highlighted the importance of patient access, including affordability. From this study, strengthening and improving the CAM infrastructure to foster greater information exchange, improving and increasing the understanding, dissemination, and use of CAM among the stakeholders would be rewarding.

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