Africa's Telenursing Today (and Tomorrow?)

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Abstract— **Although telenursing is well established in developed nations, developing nations have much less such activity. In Africa, and particularly South Africa, some effective pilot telenursing schemes have been introduced and are presented here. A further success has been in a wide variety of teleeducation programmes which target nurses. Usually telenursing equipment and procedures that have been successful in the well-resourced world are inappropriate for transfer, without modification, to developing countries. However African telenursing applications have used relevant prior knowledge in the field, wherever possible. These applications, with a likely future course and means of accomplishing it, will be outlined using what little quantitative data is available.**

Keywords - Telenursing; Africa; Telemedicine; Teleeducation; Distance learning.

I. INTRODUCTION

Because of a general shortage of physicians in Africa, its nurses often have greater responsibilities than in many other countries and much of the continent's public health care is provided by nurse practitioners in village clinics. Such nurse-directed clinics, also found in some small towns, form the backbone of African primary health care (PHC) services. These facilities are commonly far from the nearest medical doctor, or hospital, and they are usually located in regions where local infrastructure and transport services are poor. So, African nurses often have much authority. Telenursing can greatly aid their provision of PHC, and their management of both chronic conditions and certain acute situations. But there are significant differences between telenursing in developed countries and Africa, because of funding available, experience with, and availability of, information and communication technology (ICT), other infrastructure and physical conditions, the nature of their patients' illnesses, stage of presentation of the diseases encountered, etc. Many of these differences are also applicable to telenursing in other poorly-resourced regions.

Telenursing has many definitions, but we consider it as the use of ICT and electronic transfer of information relevant to nursing. As we shall show, telenursing can support virtually all aspects of nursing activity, often in ways not otherwise possible. This is especially true in Africa, where personnel, equipment and expertise often lack, as is the case sometimes in the developed world's most remote rural situations. In this report a nurse is deemed someone, often a female, who has been trained to care for those experiencing illhealth; the sick, infirm and disabled. Equally importantly, a nurse promotes healthy growth and development in children and the establishment and maintenance of health in all age groups. Telenursing is closely associated with telemedicine [1], which has been available since before the invention of the telephone, whose availability greatly increased telenursing and telemedicine activity in the first half of the last century. However telenursing has greatly increased in the last few decades. This results from the recent vast explosion of computer power and the wide variety of readily available electronic communication modalities, whose costs are steadily decreasing.

From a search of the U.S. National Library of Medicine's database it was determined that there are over 150 times more publications on telenursing from developed countries than on African telenursing, which today is in its infancy [2]. Hence its practices, norms and applications are still in the process of being established. Because application of ICT is necessary for telenursing, it was first set up where there was appropriate funding, technical expertise and infrastructure. Therefore in developed countries, telenursing grew steadily and, after its utility was confirmed, it began to be applied to the needs of the poorest nations in Africa and other developing regions.

Today's level of African telenursing justifies a critical study of its history, current applications and impact. This study is based mainly on South African telenursing. Using South African experience is particularly apposite now, for several important reasons. In contemporary rural, and much of peri-urban, South Africa there are social and economic conditions that are characteristic of the poorest nations of Africa. (In contrast, there are also infrastructure, nursing and medical services in South Africa of a high standard, principally in the private health care domain of large urban centres.) Before democracy was established in 1994, South Africa was almost totally isolated from other African nations. Since that date warm relations have developed between South Africa and other nations of the continent, resulting in steadily increasing numbers of

cooperative projects in all medical fields and throughout Africa. Such health care endeavours have increasingly allowed South Africa to use its expertise and experience, gained in its own poorly developed remote rural regions, for the benefit of others. Also experience gathered in well-resourced nations is relevant to Africa's telenursing, for lessons learned elsewhere can reduce wasteful duplication. At the same time it is essential to appreciate that often telenursing practice, training, equipment and application in a wealthy country may be inappropriate to be transferred without change to a public health service in Africa. Here the physical and other circumstances and needs often differ from those of the developed world. So for effective introduction of telenursing, modification is frequently essential.

There is a world-wide lack of all types of health care workers (HCWs), especially so in the most economically-deprived nations, many of which are found in sub-Saharan Africa. [3] Nurses are usually the principal HCWs in poorly-resourced nations, especially in their rural regions. Yet the attitudes of patients to nursing practitioners in developing countries have not been extensively investigated, in contrast to the USA. There such nurses, with more independence and clinical responsibility, have been practising for over 40 years and their professional activity is known to the vast majority of the USA population. They are in great demand and about 60% of that nation's population have used their services. A large majority (82%) of their patients were satisfied, or better, with their ministrations. [4] Similar or better results are probable in Africa, where fewer health care alternatives are available. In South Africa most public health service rural clinics and dispensaries are located in villages, with rare visits (or often no visits at all) from medical doctors. Thus, the potential for telenursing to support and improve these nurse practitioners' service to their local public is very great. Another aspect of telenursing, particularly valuable for Africa, is provision of continuing professional development using distance learning. This important topic is already the subject of current successful projects and will be considered in greater detail below.

Worldwide there are few formal qualifications concerning the practice of telenursing and in most African countries very little incorporation of telenursing and associated subjects in the state-approved nursing curriculum. Although South Africa has many, varied, ongoing telenursing activities, the South African Nursing Council, a statutory body, which, "controls and exercises authority in respect of all matters affecting the education and training of registered nurses, midwives, enrolled nurses and enrolled nursing auxiliaries" and determines nursing curricula, has no material on telenursing in the official curriculum of 2010, although ICTs do feature. So in South Africa and most other countries telenursing is usually informally taught with few recognised requirements for its practitioners. However in Queensland, Australia, the State Government has introduced the formal qualification of "Telenurse". This can only be obtained by a state-registered nurse, who must then undergo further study and training. [5] Most persons involved in telenursing (both telenurses and callers) are female, so gender issues can play an important role in telenursing. A telenurse must be able to interact with a caller in a wide variety of ways. This is because on occasion the telenurse may be required to advise, assess, refer, support, teach and also offer selfcare advice and triage, if necessary. [6] Therefore telenursing requires a marked level of competence. African state-registered nurses have this in abundance, for often they have more responsibility than their equivalents in developed countries and their professional instruction is of a high standard. This is confirmed by the ongoing brain drain of African state-registered nurses to European and other developed nations and the frequent lack of examinations that they must pass before they are allowed to practise after emigration.

A shortage of HCWs exists in all developing countries and detailed World Health Organisation (WHO) studies of HCW needs in Ethiopia, Ghana, Kenya, Malawi and Tanzania suggest approaches to improve this situation. These include increased use of modular education and ICTs. [7] Telenursing can also play a major role in such programmes in all African developing countries. There, over 60% of health problems result from largely preventable infections (e.g., malaria, tuberculosis (TB) pneumonias and viral infections [8]). Adaptations necessary for African telenursing to be practical and effective and the roles of educational and clinical telenursing activity will be outlined and discussed below.

II. AFRICAN TELENURSING'S STATE OF THE ART

Recent publications have indicated that in the last year there have been many significant advances in African telenursing. However since infrastructure is often lacking, simple modalities of communication are most often employed. In developing countries about half of reported telemedicine uses Email, with many fewer real time interactions. [9] Mobile phones are readily available .throughout Africa and their utility to support management of the chronically ill of the poorest Hondurans has been reported. [10] Moves are afoot to reproduce this in Africa. A successful pilot scheme in Malawi combines mobile phones and text messages to contact patients up to 100 miles from the base health care facility. [11] After 6 months, 2000 hours of travel time were saved and the number of patients in an anti-TB programme doubled. Cervical carcinoma is very common in Africa and a novel telenursing network attempts "to bridge the gap between screening and diagnosis" in Zambia. [12] Use of digital cervicograms allows participating nurses to discuss their significance with patients and permits further consultation as required. But in spite of these successes, it is very clear that "The human touch is essential. A named health care provider with access to telehealth" facilities must, wherever possible, be available. [13] Incidence of

cardiac problems is steadily increasing in Africa and it has been clearly demonstrated that a telenursing programme directed towards aiding chronic heart failure results in "improved patient care and medication concordance and reduced use of health care services". [14] Similar advantages have been reported for preventive care where telenursing intervention improved cardiovascular disease risk awareness. [15] This work presents the current situation of African telenursing and some indications of how it may evolve.

III. TELEEDUCATION IN AFRICA FOR NURSES

Teleeducation applications of telemedicine in Africa have demonstrated even more success, than clinical health care. [16] Although telenursing links are usually set up to transmit queries, requiring a consultant's response, and information concerning patient healthcare, their bidirectional nature also enables educational material to be sent to nurses at telenursing sending locations. African nurses have enthusiastically embraced such teleeducation. It can provide both theoretical and practical knowledge. Also it can allow the sharing of experience to improve the quality of professional services offered to patients. Conventional face-to-face, teaching methods, whether residential or not, can achieve the same ends, but these may involve travel (often over large distances for rural African nurses), significant time spent away from the usual workplace and accommodation expenses. Teleeducation can overcome many of these limitations and costs. Teleeducation for nurses in Africa can not only provide possible future theoretical educational possibilities. It is important to recognise that there have already been concrete achievements at a variety of levels in African distance learning for nurses.

Web-based distance learning is now possible for all countries with Internet connections and according to UNESCO (the United Nations Educational, Scientific and Cultural Organisation) there are at least 53 such African nations. [17] Its success has been clearly demonstrated in several existing African nursing projects, which are web-based, sometimes totally so. For example nurses usually play a crucial role in palliative care. The only recognised qualifications obtainable in Africa in this field of study are a postgraduate diploma and degree (M Phil), both offered by the University of Cape Town, South Africa. These courses depend almost entirely on web-based distance learning. Since the course's beginning, 11 years ago, it has trained over 200 students from 12 English speaking African nations. A very recent educational evaluation of this programme considered the 125 registrants of the course, who were enrolled between 2000 and 2007. [18] It concluded that it is, "applicable to current community needs and appropriate for the participants". Further, the assessment expects that, "palliative and hospice care no doubt will evolve into a mainstream service within South Africa's health care system". Such are the impressive

consequences of one specific African teleeducational course. This postgraduate programme is only open to nurses and medical doctors. Its curricula are adjusted for conditions in the student's homeland and emphasise family dynamics, both for extended and nuclear families, since they must have much relevance for the current scourge of HIV/AIDS that is now sweeping across sub-Saharan Africa. Although there is a clear need for these skills in Africa, many of the continent's countries have no expertise in palliative care. [19] In 2011, the same university will offer another Master's degree course in Public Mental Health, based on teleeducation. This too will be directed towards postgraduate nurses and in its first year will emphasise planning and implementation of policy. [20] The University of Cape Town has also made available 14 modular, computer-based teleeducation courses on community paediatrics. These are intended for nurses in rural community health centres and clinics, who often have no direct access to paediatricians. [21] Teleeducation in other nursing fields is also available and/or under development. In South Africa there is compulsory community service of one year for newly graduated nurses, who are usually assigned to remote rural areas where there is the greatest lack of HCWs. In spite of working with experienced colleagues, they frequently feel very isolated. With telenursing facilities at their workplace this sense of isolation is greatly reduced, leading to a happier and more productive community service, in addition to valuable acquisition of knowledge.

Moroccan nurses have available a paediatric oncology-haematology web-based programme that also serves nurses in other developing countries. [22] Overall, paediatric cancer cure rates are about 75% in developed countries and a third of this in developing nations, where it can be the leading cause of death in children aged 5-15 years. Hence such a programme can save many lives, for about 80 - 85% of all childhood cancers occur in developing countries, where survival can be under 10%. [23] Another application of a web-based site has been for a nursing study in Ethiopia, and other developing countries, investigating a mother's mental health and her child's nutrition status. This work "confirms that promotion of maternal mental health may be important for the improvement of child nutrition." [24] Obstetric complications are a frequent cause of death in developing countries and worldwide this causes >500,000 deaths yearly. [25] The assessment and improving of skilled birth attendants in Benin, Rwanda and other developing countries has recently been underway, with WHO support. A website played an important role in training local assessors and this successful pilot scheme has been extended to Niger and Kenya. [26] A joint Eritrean-USA teleeducation programme for nurses provides instruction in challenging aspects relevant to their practice in Eritrea. One of its aims is to train tutors for local nursing schools. [27] Midwifery was selected as the first discipline for this approach. Appropriate technology was introduced and the

overall emphasis was on clinical application. Student input and flexibility were crucial parts of the curriculum design.

A particularly distressing statistic is that of recent trends in infant mortality rates. In many developing countries they have either remained static or have increased (as in South Africa) during the last few years. Such deaths are mainly preventable and most often are caused by infectious diseases (pneumonias, tetanus, etc) in the first week of life. Such mortality can be reduced by appropriate and sufficient nutrition, particularly breast feeding. This assists in giving the infants antibodies to fight infectious diseases, as well as nourishment. UNICEF, the WHO and other bodies recognise that nurses can play an important role in improving this situation. So an "essential newborn care programme" to decrease high infant mortality rates was drawn up and has been evaluated. Use of a self administered, computer based course was found to be equally successful in increasing relevant knowledge as the conventional face to face course in South African and Zambian studies. [28] In developing countries, resources are lacking and the lower cost of a teleeducation course in this critical field can allow much greater dissemination of relevant knowledge, for a given level of funding.

In order to benefit from telenursing advances in developed nations, without duplication of the efforts required to make these advances, it is essential to examine how established telenursing programmes, and those under development, can be adapted for use in Africa. Some examples follow. Disaster aid in regions affected by abrupt deterioration/destruction of health care facilities or sudden and overwhelming need for such facilities is often provided by nurses. A British postgraduate qualification in nursing for post disaster relief uses teleeducation and emphasises aspects of transcultural nursing. All these characteristics make it especially useful in the African context. [29] In the Netherlands nurses drive a pilot programme to enable appropriate and vulnerable patients to monitor, and if necessary change, their risk profile for vascular disease, by teaching them to self-manage more effectively. [30] This interactive principle is suitable for some African applications, for it is noted that vascular disease prevalence is steadily increasing in Africa, paralleling the continent's rapid urbanisation of the last few decades and the resulting life style changes.

Developing countries often lack proficiency in paediatric emergency care and the necessary facilities are scarce. A training scheme to address this lack in Vietnam was established initially in Australia for Vietnamese nurses with different professional backgrounds, and others. It also undertook instructor training and provided organisational experience. [31] This training programme proved sustainable for transfer to the developing regions in need of this expertise. African nations can clearly benefit from this approach, to obtain improved expertise in this and other fields and moves are under way to establish such a course in

Africa. The programme and necessary updates use telenursing techniques.

In Malawi, as elsewhere in Africa, malaria is a principal cause of morbidity and mortality, especially for children, in whom about 90% of the life threatening form occurs. The greatest mortality is found in those less than 5 years of age. Relevant clinical management in Malawi was studied [32] and the principal result was that the care offered to children at the first referral level, principally given by nurses, required revision. Telenursing can provide the necessary information to those in PHC clinics to implement this important finding, in the many countries of Africa where malaria is a serious health problem.

In South Africa a video programme, transmitted from a central location and operating for 4 years, is directed by nursing staff for the benefit of those in waiting rooms of public health service facilities. This programme aims to improve the patients' understanding of HIV/AIDS and other conditions. Results are very encouraging and it is to be extended to neighbouring nations. [33]

IV. TELENURSING'S ADAPTATIONS FOR AFRICA

African public health budgets are usually meagre, so extensions or modifications to existing telenursing equipment must be carefully evaluated to prevent waste of resources. The simplest procedure for telenursing, to purchase equipment and then connect it to an existing communications network, is often inappropriate for Africa. [34] So before embarking on an African telenursing project the complete project and its integration with available facilities should be very carefully reviewed. Obtaining the supportive involvement of central government, local medical bodies and leaders is crucial, especially for questions of regulation and incorporation with pre-existing health services. [35] The technology and procedures finally selected will depend on the users' computer literacy abilities, available infrastructure, etc. All these points may be self-evident, but they are too often passed over for many reasons, ranging from a lack of technical knowledge, to equipment sellers' lack of scruples. Because of incoordination between the nine South African provinces' ICT standards, there is no single ICT system for HIV/AIDS management that can be used in the whole country. [36] Hence, adequate preparation before setting up a telenursing network is essential. If possible, nurse users should be invited to use the equipment, before a final choice is made. Frequently their suggested modifications in procedures, equipment, etc., may be of great benefit, for this can improve network and other function. [37] As an example of such benefits, a ruggedised, simple, telenursing workstation, designed in South Africa, was modified by adding a remote control and simplified menus. So then it became much more acceptable for its nurse users, whose previous ICT experience was minimal or zero.

Cellular/mobile phone systems have been introduced into almost all African countries and adopted so

enthusiastically at all levels of society that 40% of Africans have a mobile phone. [38] Since many poor regions of African nations have satisfactory phone signals, this technology can be incorporated into African telenursing, as has been successfully done in India. [39] Such application has been beneficial for management of serious chronic conditions [40] and to ensure appropriate action in medical emergencies, such as those occurring in childbirth. The latter suggestion was made for Burkina Faso. [41] What is now new in developed nations' telenursing will later often become available, if required, in Africa. But local African needs and conditions must be considered to ensure the most effective application. For example software used to aid decision making by telenurses has both pros and cons. It simplifies telenursing and often complements telenurses' knowledge. But also it can be incomplete and in conflict with their independently formed decisions. Overall telenurses preferred having it available, although it cannot always replace their own nursing expertise. [42] Such software, being considered for use in Africa, should be modified, for example to include and emphasise conditions common in the continent, but much rarer elsewhere.

Kenya is the only sub-Saharan African developing nation with a nursing database. [43] It provides reliable nursing information about workforce capacity, demographics and migration patterns, so allowing assistance in determining optimum distribution and most effective use of health personnel.

V.   AFRICAN CLINICAL TELENURSING

African telenursing has been able to benefit from experience in developed nations where telenursing has been applied and steadily developed. Resulting knowledge and experience gained there have been adapted and expanded as necessary to provide telenursing most suitable for Africa. Transfer of such activity and knowledge to Africa has accelerated as costs of equipment have decreased and ICT availability and expertise have both improved in recent years.

It is well known that HIV/AIDS is currently savaging Africa. About 60% of the world's HIV infections are in sub-Saharan Africa [44] and the world's largest current anti retroviral therapy programme is in South Africa. [45] Applications of telenursing can alleviate many aspects of this scourge. Feeding of infants by mothers infected by HIV/AIDS has been studied by the WHO and guide-lines drawn up to aid prevention of virus transmission from the mother to infant. Three clear conditions for this feeding have been established, to greatly reduce the occurrence of infant infection. However, over two thirds of South African HIV/AIDS infected mothers do not fulfil these criteria, with increased risk of viral transmission to their infants. Appropriate counselling of these mothers at their baby clinics, or elsewhere, is urgently required, not only in South Africa but in many other similarly affected African nations. Telenursing links can facilitate provision of guidelines for

nurses to provide such counselling and also to make available counsellor training. [46]

Stigma of those infected by HIV remains a serious problem in many African societies and this has been unambiguously shown to violate human rights in South Africa, Swaziland, Tanzania, Lesotho and Malawi. [47] Until this stigma is overcome and the associated damage redressed many believe that the pandemic will continue, because of the consequent difficulty in ensuring that individuals' HIV status known. A recent detailed survey in Tanzania, Zimbabwe and South Africa, indicates that education and widespread HIV testing are essential to produce any significant reduction of HIV related stigma. [48] A teleeducation programme, outlined above, attempts to provide such education. [33] A report has shown that Zambian nurses, either infected with HIV/AIDS or caring for HIV positive patients, can be greatly aided by participating in local support groups, which focus on appropriate training and monitoring. [49] Telenursing techniques allow such assistance to be rendered more effectively at reduced cost, than by using traditional methods.

A South African project illustrates how an initial emphasis on clinical consultation via telenursing can lead to improved nursing ability and service to the public in several different ways, which include teleeducation. At a nurse-directed clinic, in a poor region where there is much alcoholism and violence, disturbed patients often present. This provides a dilemma, especially at the weekend, when specialist opinion is unavailable. The nurses have had little training in psychology and the only management available at the weekend is for the patient to be transferred to police cells, to await the arrival, on the following Monday, of the district surgeon. S/he likewise may have had little psychological training. A department of psychology (of the University of the Western Cape, in South Africa), located in the provincial capital, is responsible for this clinic's mental health practice, but due to its location 450 km away, there is infrequent direct contact. An audio-visual telepsychology link greatly improved this situation and other benefits quickly followed. Psychology students in the university could experience pathology, rarely encountered in their urban setting, through the telenursing link. Practical training for the clinic nurses in managing disturbed, and other, patients became possible. Also two other distance learning programmes, provided by staff members of the department of psychology and using the telenursing link, resulted in much additional benefit. Both programmes trained volunteer lay counsellors. One was directed towards local professionals, such as clergymen, librarians, school teachers, social workers, etc. The other novel programme taught high school pupils, as peer-counsellors and this proved particularly effective. Such programmes would have been totally impractical without a teleeducation facility. It was much regretted that this programme ended abruptly because of equipment theft.

South African telenursing programmes are being extended throughout the continent under the aegis of regional bodies, such as the Southern African Development Community (SADC) with 15 southern African members and the New Partnership for African Development (NEPAD), with 18 nation members in all parts of Africa. Both SADC and NEPAD emphasise collaborative health programmes for African nations and actively encourage telemedicine.

DISCUSSION

It is clear that in Africa there are many telenursing activities underway; some are pilot schemes and others are well established. It is now appropriate to enlarge their scope and to involve more African countries. South Africa is ready to take a leading role in this extension, having had a head start, as shown by its current telenursing activities, some of which have been outlined above. African telenursing is changing rapidly, as is indicated by the recent publication dates (2007 and later) of about 80% of the references to this paper. Benefits of telenursing are well known and varied, including savings in travel costs and increases in nursing expertise. After several patients with similar conditions have been referred by a telenurse, subsequently s/he is often able to manage comparable patients without referral. This was clearly demonstrated by a local pilot dermatological telenursing project. The referring telenurses very often encountered HIV infected patients, for >95% of HIV infected patients have dermatological lesions and the severity of such dermatological pathology closely reflects progress of the HIV infection. After the telenursing link provided management regimes, for a few weeks the participating nurses' steadily increasing experience enabled them to diagnose and manage increasing numbers of HIV lesions without referral.

Very little analysis of economic benefits of African telenursing has been performed. However in developed countries diminished travel costs provide clear savings and this benefit is becoming apparent in Africa too. The telenurses' increased experience from telereferrals has already been outlined and its consequence is an improved local health care service. The principal advantages of teleeducation are plain, for the resultant nursing education of all sorts, especially continuing professional learning, is less costly when travel is eliminated. African telenursing is evolving to satisfy African needs. It recognises that technical and infrastructure conditions and pathology in the continent may differ from those of the nations where telenursing equipment and applications were first derived, so for an optimal role, modifications are often necessary, as summarised above.

Overall the essential benefit of telenursing is an improved service for those whom the nurses serve, especially patients receiving PHC. This has been recently confirmed in an extensive pilot programme in Brazil, which is intended to a model for a National Telehealth Program. [50] Its findings substantiated South Africa's related

experience, which is that both direct PHC health care and the professional knowledge of the nurses who administer it, benefit significantly. A report on this pilot found that "Telehealth has strengthened the role of primary health care… It has reinforced primary care units … and has provided primary care staff with a powerful arsenal of up-to-date information and tools". [50] Telenursing is usually less expensive than traditional nursing, but there are situations when it may even be more costly, for in some rural areas of Africa it replaces a situation where no local service at all was previously available. Today, all Australasians have free access to nursing advice via the phone. [51] One day such telenursing service will be available in Africa. The path to this goal is long, but the first steps of this journey have been made, by preparing projects using the rapidly increasing numbers of mobile phones in Africa.

CONCLUSION

Telenursing activity in Africa has steadily increased, as the work of telenursing pioneers, in well-resourced nations has been studied and adapted according to African needs, conditions and infrastructure. It is essential to modify techniques and equipment in terms of the continent's technical, infrastructural and computer literacy levels and its different range of pathologies. This can ensure effective application of telenursing in Africa. Also teleeducation has greatly benefited African nurses and, with the wide range of existing collaborations, it seems that Africa's particular form of telenursing is now set to expand steadily, so that it will continue to contribute significantly to marked improvements in Africa's health care.

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