

Review Article

Robotic surgery in Nigeria: an uncertain possibility

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ABSTRACT

Since its introduction about 2 decades ago, surgical robots are becoming increasingly used in many surgical operations. The emerging technology has increased the efficiency, reliability and precision of surgical procedures. It has minimized overall post-operative complications and led to faster patient recovery. Although there are some limitations to robotic surgery, its many advantages have generated great excitement within the surgical community. Thus, there is an exponential growth in the use of the surgical robot across numerous surgical specialties and in many developed nations of the world. In Africa, the robotic surgical system has only been adopted in South Africa and Egypt for limited surgical cases. However, there has been no documented use in Nigeria. The implementation of robotic surgery in Nigeria is being hampered by low budget allocation to health, a regressive health care financing model, epileptic power supply and most of all, poor leadership make the implementation of robotic surgery in Nigeria challenging. The cost of acquiring and maintaining the surgical robot will gradually become cheaper as more robotic surgical manufacturers enter the marketplace, thereby making it more affordable and accessible in low- and middle-income countries. Effective leadership and critical investment in health care systems and human capital, will increase the possibility of implementing a robotic surgical program in the future.

Keywords: Robotic surgery, Faster patient recovery, Regressive health care financing model, Poor leadership, Healthcare systems, Nigeria

INTRODUCTION

The use of robotics in surgery has increased dramatically in many parts of the world and across numerous surgical specialties. From radical prostatectomy to complex head and neck surgeries, the surgical robot has revolutionized the practice of surgery and has enabled a simpler approach to complex procedures. The growing interest in this new technology is due to its ability to improve patient outcomes and enhance surgical experience in many ways.

Robotic surgery is associated with a significant reduction in overall complications, length of postoperative recovery and hospital stay, post-operative pain and analgesic requirements, and enhances better cosmetic outcome.^{1,2} Surgeons also enjoy a three-dimensional (3-D) high definition view with a 10-15 times magnification allowing

them to be immersed in the surgical field. This is in addition to, offering seven degrees of freedom, tremor reduction, accurate camera control, and improved ergonomics of the operating theatre. Robotic surgery also offers a much easier and faster learning curve compared with laparoscopy.¹⁻³

The high financial outlay associated with acquiring and operating the surgical robot poses a major limitation to its use. Setting up the robot and the operating environment requires a substantial amount of time which contributes to longer operating hours. The current robotic surgical system is also huge and massive, taking up more space in the operating rooms (OR). It also lacks haptic feedback, so surgeons rely majorly on visual clue and past experience as they cannot feel the organs or the tautness of a knot.³

Despite the ongoing robotic revolution and the growing number of robotic-assisted procedures globally, there is very limited access to this technology in Africa. South Africa and Egypt are the only countries in Africa utilizing the robot in surgical practice.^{4,5}

To the best of the author's knowledge, there is no documented robotic surgery experience in Nigeria. This article aims to examine the challenges of implementing a robotic surgical program in Nigeria, followed by a discussion on the possibility of such in the future.

CURRENT CHALLENGES

Currently, Nigeria has no known surgical robotic program implemented. Even laparoscopy, another form of minimally invasive surgery, introduced decades ago is not in widespread use in hospitals across the country and has only been deployed in limited specialties. The Nigerian healthcare sector is laden with so many problems that the introduction of robots for surgical practice is a tall dream for the country.

Inadequate budgetary allocation to healthcare with the year-on decline in government funding of the sector relative to the overall budget size is a major challenge to the implementation of a robotic program in the country. The robotic unit costs between \$0.5 million and \$2.5 million with an annual maintenance cost of \$80,000 to \$170,000.⁶ Nineteen years on after the Abuja declaration on increasing government funding to improve healthcare in African Union countries, Nigeria is yet to meet the minimum allocation of 15% of her annual budget on healthcare.⁷ Nigeria, where the declaration was made, has only recorded 5.8% as the highest percentage allocated to the sector which occurred in 2012.^{8,9} The situation seems to be deteriorating as the current (2020) budget only allocated a meager 4.14% to healthcare.¹⁰ With the continuous decline in government funding of healthcare, tertiary hospitals in Nigeria are struggling to provide essential surgical services and maintain existing infrastructure. Hence, the possibility of implementing a robotic program seems out of reach.

Out-of-pocket (OOP) spending is the main mode of healthcare financing in Nigeria - another implication of poor investment in healthcare by the government.¹¹ Even if a robotic surgical program is currently been implemented in the nation, OOP payment poses a major limitation to accessing such expensive surgical service. Aside from the huge initial cost of acquisition of the robot, an additional \$700 to \$3,500 for instruments and accessories per procedure puts the cost associated with robotic-assisted procedures in the range of \$3,000 to \$5,000. It is estimated that on average, a patient undergoing robotic-assisted procedures will pay more than another patient undergoing open or laparoscopic surgery in the hospital.¹² The national health insurance scheme (NHIS) was set up to reduce the financial burden of OOP but it is limited in both the percentage of the population

(less than 5%) and the scope of the healthcare services covered.⁹ Already, almost 70% of total healthcare financing is OOP, the most regressive method of healthcare financing, with resultant catastrophic health spending pushing many families into poverty.^{11,13} Therefore, the high bill of robotic procedures cannot be afforded by many patients and their relatives.

A robotic surgery program requires the service of a specially trained team led by an experienced surgeon and appropriate volume of patients annually to keep the program afloat.¹⁴ The lack of experience in robotic surgery in the nation means that trained surgeons have to be imported and huge investment has to be made in training other members of the team. This will significantly increase the overall cost incurred in setting up the program. Considering that OOP is the primary source of healthcare financing in a country where about 70% of the citizen live below the poverty line, patients will opt for traditional open surgery as against the more expensive robotic option.¹⁵ The resultant low patient volume limits hands-on exposure, lengthens the robotic surgery learning curve, and in the long-term, makes the training unsustainable and the program cost-ineffective.

Surgical robots require a huge electrical power demand which makes stable and constant power supply an absolute necessity. In Nigeria, as with most developing countries, power supply remains highly inadequate. The supply from the national grid is grossly unreliable and further characterized by frequent outages and power surges which may damage the surgical robot. It is not uncommon to make liaising with the engineering department of the hospital a checklist to ensure the generating set is functioning in case of power outage with attendant financial implications. Imagine the magnitude of problems that may occur due to a power outage during a surgical procedure involving the robot.

Poor healthcare leadership and management expertise is central to the current realities of the Nigerian healthcare system. In fact, it underscores the persistence of the poorly developed healthcare system in Nigeria. Serial corruption, lack of political will, poor resource management, inefficient and poorly integrated healthcare programs amongst others manifest as ineffective, inefficient, poorly regulated, and costly healthcare with attendant dissatisfaction of end-users and poor health outcomes. These realities mitigate against the possible adoption and use of robotic surgery in Nigeria.

FUTURE PROMISES

Even with the toxic mix of challenges in the Nigerian healthcare sector, the country has played a dominant role in advancing surgical practice in sub-Saharan Africa. Many complex and highly specialized procedures have been performed in various surgical fields ranging from general surgery to neurosurgery.

University college hospital, Ibadan, Nigeria's oldest teaching hospital, has been at the forefront, pioneering several landmark medical and surgical interventions in sub-Saharan Africa. University college hospital, Ibadan is the first and only hospital in sub-Saharan Africa that offers awake craniotomy for resection of brain tumors and the institution also popularized neuro-endoscopic procedures in the region.¹⁶

Since the first set of open-heart surgeries in 1974 and 1979 at the University of Nigeria teaching hospital, Nsukka and University college hospital, Ibadan respectively, the former has performed over 102 additional cases before the turn of the millennium.^{17,18} Many teaching and private facilities in Nigeria, through collaboration with established centers in developed countries and various medical missions, have conducted several open-heart surgeries since the first set of cases. Others are in different stages of development of their own open-heart surgery programs.¹⁹

Over the last 2 decades, Saint Nicholas hospital, a private tertiary hospital in Lagos state, has independently performed 150 renal transplantation which solely accounts for about 80% of all renal transplantation in sub-Saharan Africa.²⁰ The same hospital also performed the first laparoscopic donor nephrectomies and pediatric kidney transplant in sub-Saharan Africa in 2008 and 2009 respectively.²¹

In another giant stride, a private hospital in South-Western Nigeria, Lagoon hospital performed the first successful metallic replacement of whole arm bone in 2013.²² Two years later, another hospital in the same region, the Lagos state teaching hospital (LASUTH) performed the first successful cochlear transplant surgery. Both procedures are the first successfully performed surgeries of their kind in the West African region.²³

Several other highly specialized surgical procedures including knee replacement, endoscopic, bariatric, and reconstructive surgeries, which all make use of expensive and sophisticated equipment and require a high degree of surgical expertise, are frequently performed in different hospitals across the country. All these give hope that the country has the potential to adopt cutting edge technology such as robotics to transform the practice of surgery and improve healthcare delivery to match global standard.

CONCLUSION

Robotic surgery is expected to contribute immensely to the growth of the surgical specialty. Given the advantages of robotic surgery, it is predicted that robotic-assisted procedures will be the new standard of care for surgical patients in the future. In spite of Nigeria's steering role in surgical practice in sub-Saharan Africa, the country still lags behind other developed nations in the provision of surgical interventions.

As stated in the article, the emerging field of robotic surgery remains very expensive for Nigeria. It is hoped that as more manufacturers of robotic surgical systems enter the marketplace, it will spur the development of a new generation of surgical robots that are cheaper, competitive, and deployable for use in developing countries. This, in addition to critical investment in health care systems and human capital, accelerating private-public partnerships and curbing the menace of corruption in the health sector can add little certainty to the future of robotic surgery in Nigeria.

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