

# Zaria Universal Oxygenator Holder Phase I

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## ABSTRACT

**Introduction:** The conduct of cardiopulmonary bypass surgery requires the use of equipment and devices like the oxygenator. The oxygenator comes in different makes and each manufacturer customizes the carrier or 'holder' of this device specific to their design. **Aim:** This paper presents an innovation designed to overcome the need to purchase a different holder for every oxygenator thereby cutting the cost. **Materials and Methods:** A sheet of iron measuring 1.9 cm (width) × 0.1 cm (thickness) was used to design the holder circular main frame. Another sheet measuring 2 cm (width) × 0.6 cm (thickness) × 24 cm (length) was used to construct a V-shaped handle with the arms of the V attached to the main frame 7 cm apart. At the narrow base of the handle is a latch requiring two 13-gauge screws to attach the holder to the heart-lung machine. Within the circumference of the main frame are four T-shaped side arms which grip the oxygenator; located at 2, 5, 7 and 11 O'clock positions. The stem of the T consist of a 0.6 cm (thickness) × 13 cm (length) rod drilled through the main frame. The cross of the T consists of variable lengths of the same sheet as the mainframe attached to the stem by a screw mechanism. At the base of the T, is attached a circular handle (4 cm in diameter) made of 0.4 cm iron rod. **Result:** An oxygenator holder which weighs 1.75 kg with a total length of 54 cm (the diameter of the mainframe is 30 cm). Its advantages include (i) affordability, (ii) materials are locally accessible, (iii) versatility (iv) reproducibility. The disadvantages include, (i) it requires some time to fit, (ii) caution is required in fitting the oxygenator to avoid breakage, (iii) a spanner is required to lock the latch. **Conclusion:** The concept of a universal holder is pertinent, especially in resource poor environments to avoid purchasing a new holder whenever the usual oxygenator common to the centre is unavailable. This device is amenable to further modifications to meet the unforeseen challenges.

**KEYWORDS:** Holder, innovation, oxygenator, universal

## INTRODUCTION

The conduct of cardiopulmonary bypass surgery requires the use of several equipment and devices like the oxygenator.<sup>[1,2]</sup> The oxygenator comes in different makes depending on the manufacturer and each manufacturer customizes the carrier or 'holder' of this device specific to their design [Figures 1 and 2].

## Aim

This paper presents an innovation designed to overcome the

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need to purchase a different holder for every oxygenator thereby cutting the cost.

## MATERIALS AND METHODS

A sheet of iron measuring 1.9 cm (width) × 0.1 cm (thickness) was used to design the holder circular main frame [Figure 3]. Another sheet measuring 2 cm (width) × 0.6 cm (thickness) × 24 cm (length) was used to construct a V-shaped handle with the arms of the V attached to the main frame 7 cm apart. At the narrow base of the handle is a latch requiring two 13-gauge screws to attach the holder to the heart-lung machine. Within the circumference of the main frame are four T-shaped side arms which grip the oxygenator; located at 2, 5, 7 and 11 O'clock positions [Figure 4]. The stem of the T consist of a 0.6 cm (thickness) × 13 cm (length) rod drilled through the main frame. The cross of the T [Figure 5] consists of variable lengths (some straight and some curved) of the same sheet as the mainframe attached to the stem by a screw mechanism. At the base of the T, is attached a circular handle (4 cm in diameter) made of 0.4 cm iron rod.

## RESULT

A metallic device with a circular main frame which holds the oxygenator within its circumference centrally and a side arm designed to attach the holder-oxygenator complex to the bypass machine. It weighs 1.75 kg with a total length of 54 cm (the diameter of the mainframe is 30 cm). Its advantages include (i) affordability, (ii) materials are readily available and locally accessible, (iii) versatility (iv) reproducibility. The disadvantages



Figure 1: Dideco (EVOS, EOS) oxygenator holder



Figure 2: Jostra (MAQUET) oxygenator holder

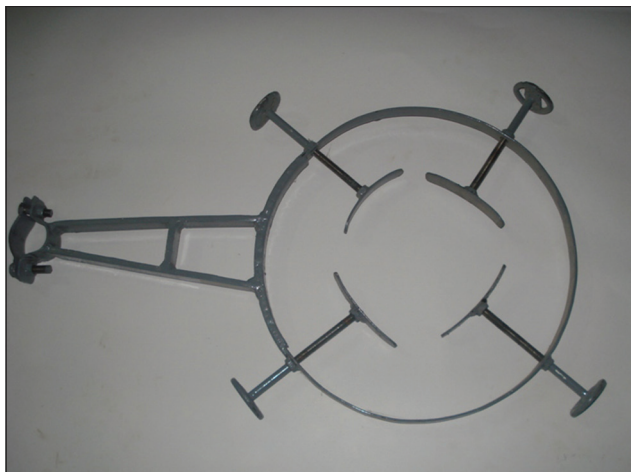


Figure 3: Zaria universal oxygenator holder



Figure 4: T-shaped side arms which grip the oxygenator within the circular main frame at 2, 5, 7 and 11 O'clock positions



Figure 5: Two crosses of the T-shaped side arm (a straight and a curved)

include, (i) it requires some time to fit, (ii) extreme caution is required in fitting the oxygenator to avoid breakage, (iii) a spanner is required to lock the latch.

## DISCUSSION

The field of medicine has seen tremendous progress over the last two centuries. The twenty-first century has seen astronomic advances not only in the understanding of the pathological basis of diseases and therefore their treatment but also in equipment design and instrumentation to aid in the care of patients and in the conduct of surgical procedures. We are witnessing an explosion in newer technologies that combine the biological, physical, and information sciences into systems that enhance technological performance well beyond previous limitations.<sup>[3]</sup> However, most of these advances originate from the western world. Developing countries spend scarce foreign exchange acquiring these skills and knowledge or importing medical devices and equipments. A good example is the phenomenon referred to as ‘medical tourism’ in Nigeria where most patients requiring complex medical interventions like heart surgery, kidney transplant, total hip replacement surgeries travel out of the country for these interventions. This not only constitutes a huge fiscal drain to the nation’s

economy but also undermines the development of the health industry in terms of manpower development and confidence in the system.<sup>[4]</sup> To stem this tide, there must be a concerted effort by the medical community to develop home grown technologies and for the government and corporate organizations to provide necessary incentives and enabling environment.<sup>[5]</sup> The Zaria Universal Oxygenator Holder (ZUOH) is a device developed to cut the cost of conducting heart surgeries for prospective tertiary health centres hoping to begin heart surgery in the country. For decades, the conduct of regular heart surgery in the country has been bedevilled by the high cost of equipment and consumables and thus the massive efflux of such patients to other countries that should compare with Nigeria in development. One of such contraption is several times far cheaper than the customized version because the materials are locally sourced and easily reproducible. Its versatility allows it to carry any type of oxygenator of any size. This circumvents the need to buy a new and different holder customized for another oxygenator when the routine oxygenator used by the centre is out of stock or inaccessible. The contraption is however not without some challenges. The weight of the holder could be further reduced if a lighter metal or an alloy of similar strength and resilience could be used. The combination of the weight and the total length of the device could affect the stability of the set-up when the cardiotomy reservoir is full, especially with adult oxygenators. Attaching the device to the mast with a spanner takes time and this aspect would require a simple and effective latch for adjustment purposes. Finally, fitting the oxygenator requires caution as excessive force could crack the oxygenator leading

to wastage while loose fitting may result in instability of the set-up. The opinions of engineering experts are being sought to see how to surmount these challenges.

## CONCLUSION

The concept of a universal oxygenator holder is pertinent especially in resource-challenged environment to avoid purchasing a new holder whenever the usual oxygenator common to the centre is unavailable. This device is amenable to further modifications to meet unforeseen challenges.

## REFERENCES

1. Frimpong-Boateng K. The Heart. In: Badoe EA, Archampong EQ, da Rocha-Afodu JT, editors. Principles and Practice of Surgery, Including Pathology in the tropics, 3<sup>rd</sup> ed. Tema: Ghana Publishing Corporation; 2000. p. 380-418.
2. Hammon JW. Extracorporeal Circulation In: Cohn LH, editor. Cardiac Surgery in Adult, 3<sup>rd</sup> ed. New York: McGraw Hill Companies; 2008. p. 349-414.
3. Bartkowski DP, Bonter NT. Surgical care in the 21<sup>st</sup> Century. J Am Osteopath Assoc 2005;105:545-9.
4. Falase B, Sanusi M, Majekodunmi A, Ajose I, Idowu A, Oke D. The cost of open heart surgery in Nigeria. Pan Afr Med J 2013;14:61.
5. Uwaifo VO, Uddin PS. Technology and development in Nigeria; The missing link. J Hum Ecol 2009;28:107-11.

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