

Management of Anaemia: An Advocacy for the Integration of Bloodless Medicine and Surgery Program (BLMS) into the Health Care System of Sub-Saharan African Countries.

Type of Article: Review

Friday S. Wokoma

Nephrology Unit, Department of Internal Medicine, University of Port Harcourt Teaching Hospital,

ABSTRACT:

Background: The prevailing high sero- prevalence of the human immuno deficiency virus (HIV) and hepatitis B and C viral infections in the sub-Saharan African populations such as Nigeria, has further increased the risks associated with allogenic blood transfusion. It has also made the availability of free blood for transfusion to needy patients increasingly difficult in recent times in these populations. It has thus become imperative for clinicians to begin to adopt less blood dependent approaches in the care of anaemic patients. This review article introduces the subject of the principles and practice of bloodless medicine and surgery (BLMS) with a view to advocating its adoption and integration into the health care programs of sub-Saharan African countries such as Nigeria.

Methods: The literature base for this article was obtained through relevant manual and on-line search using Medline, google and other resources.

Results: Bloodless medicine and surgery (BLMS) program is currently being practiced in major hospitals in North America, Europe and other parts of the developed world. BLMS was primarily developed to cater for the needs of the Jehovah's witness (JW) religious group whose religion forbid the use of blood as a means of therapy. It is now of universal application. Virtually all medical and surgical procedures including organ transplants, open heart surgeries etc, are undertaken under the BLMS programs with outcomes as good as blood based therapies. BLMS has the potential of reducing the demand for allogenic blood transfusions, reduce morbidity and mortality associated with blood transfusions as well as reduce costs of prolonged hospitalization due to delayed surgical procedures on account of unavailability of blood.

Conclusions:

The development and the integration of the BLMS program into the medical care services of resource poor, HIV/AIDS and hepatitis virus endemic sub-Saharan African countries will contribute significantly in reducing the demand for blood which is scarce, reduce the rate of irrational blood transfusions, reduce the transfusion acquired HIV/AIDS and viral hepatitis infections, as well as reduce the incidence of other transfusion related morbidities.

Key words: Anaemia; Blood transfusion; Bloodless medicine & surgery; sub-Saharan Africa.

INTRODUCTION

The firm belief and the tenacious conviction of the Jehovah Witness (JW) group to their religious faith in the rejection of blood and blood products as a form of medical therapy led to the conceptualization and the development of the Bloodless medicine and surgery (BLMS) program in the United States of America ^{1,2}. Today the program has achieved wide acceptability in several other countries of the world serving the needs of the JW community and other members of the public.

With the advent of deadly blood transfusion transmissible infections such as the hepatitis B, C and D and lately, the HIV infection ^{3,4}, many non-JW members of the public are increasingly electing for the BLMS program.

The BLMS program has been standardized and in active practice in several hospitals and clinics in many parts of the world, where virtually all medical and surgical procedures, including open heart and complex neurosurgeries are under taken without the use of allogenic blood transfusion ^{5,6}.

The BLMS program have the advantages of reducing the demand for allogeneic blood transfusion, the ability to undertake several medical and surgical procedures that would have been postponed or cancelled for lack of blood, and the virtual absence of the risk of transfusion transmissible known and emerging infections. Also the BLMS program is technologically less demanding than blood based cares.

These attributes of the BMLS should make the program more attractive for resource-poor African countries with the highest global prevalence of HIV/AIDS and other blood transfusion transmissible infections ^{7,8}.

The BLMS program will drastically reduce the prevailing irrational use, abuse and relatively high dependence on blood transfusions currently prevalent in sub-Saharan African countries such as Nigeria.

This review examines the historical evolution; principles and the practice of the BLMS program and explores its high potentials in reducing the demand for blood transfusion, curbing the prevalent irrational use and abuse of the blood transfusion process in sub-Saharan Africa.

An advocacy is made for the integration of the BLMS program into the health care delivery system of resource poor sub-Saharan African countries.

HISTORICAL PERSPECTIVES

The practice of bloodless medicine and surgery was developed in the United States of America (USA)^{1,2} in response to the challenge posed by the Jehovah witness(JW) Christian religious movement whose members reject blood and blood products as therapeutic agent. The JW are Christians who hold the Bible to be the complete word of God.

The movement was founded in the 1870's by a Pennsylvanian, Charles Taze Russell as a Bible society⁹. They are part of the Watch tower society with head quarters in Brooklyn and a global membership of over seven million people.

The JW comply with the vast majority of modern medical and surgical treatment, a good number of their members are medical doctors or belong to other health disciplines.

They base their rejection of blood and blood products on several Biblical verses in which “God forbids man from eating blood.” Such Biblical verses as quoted by them include, Genesis 9:3-5 ,Leviticus 17:13-14,Acts of the Apostles 15:19-20.etc”.The most frequently quoted of these is in Genesis where God was said to have told Noah(after the floods) “every moving animal that is alive may serve as food for you, as in the case of green vegetables i do give it all to you.only flesh with its soul- its blood you must not eat”.

Members of the JW hold so strongly to this belief that all members world wide, carry identity cards identifying them as JW. In the ID-card, it is clearly stated that “the bearer does not accept blood/blood products as a form of medical therapy. That under no circumstances (even at the point of death) should the bearer be transfused blood or treated with blood products”.

This strong position of the JW clearly brought them in conflict with the medical ethics. Doctors and hospitals in the USA resisted the position especially when unconscious adults and minors who cannot make informed decisions on their health are involved. Several cases of litigations arose with some cases ruled in favour of the JW.

In one such judgment, a New York court of appeal ruled as follows:-“The patients right to determine the course of his/her treatment is paramount. A doctor cannot be held to have violated his legal or professional responsibilities when he or she honours the rights of a competent patient to decline medical treatment. That the ethical integrity of the medical profession while important, cannot outweigh the fundamental individual right here assert”¹⁰.

The JW however took up the challenge by sponsoring and commissioning several laboratory animal researches to demonstrate that medical and surgical procedures can be performed successfully using some special techniques without the use of blood or blood products. The result of these studies were published in first rate scientific journals in the United states.¹

Following this, medical scientists started experimenting same in human beings and the results were found to be impressive.

The problems of the scarcity of blood for transfusion to seriously injured soldiers during the first and second world wars gave further impetus to the concept and the practice of bloodless medicine and surgery. Today the practice of bloodless medicine and surgery is accepted and consolidated in the USA and some other European countries not only for the JWS group but also for the general public^{5,6}.

To date well over 52 first rate hospitals (see Table I) in the USA have installed the program. While the JW controlled hospitals engage in only bloodless medicine and surgery, in the other centers a patient has option of choice between bloodless medicine and surgery service or blood based service. These hospitals undertake virtually all medical and surgical procedures as is the case with regular hospitals. Table II shows the wide range of medical procedures they undertake under the bloodless medicine and surgery program.

Table -1: Some hospitals in the USA where bloodless medicine and surgery is practiced.

S/N	INSTITUTION
1	THE MIAMI JACKSON MEMORIAL HOSPITAL CENTER FOR BLOODLESS MEDICINE AND SURGERY
2	FOUNTAIN REGIONAL HOSPITAL AND MEDICAL CENTER PIONEERS IN BLOODLESS MEDICINE
3	THE FLOWER HOSPITAL SPECIALIZING IN HEALTH CARE WITHOUT BLOOD TRANSFUSION
4	BLOODLESS MEDICINE AND SURGERY CENTRE AT THE BRIDGE PORT HOSPITAL
5	THE ST. VINCENT HOSPITAL CENTER FOR BLOODLESS MEDICINE AND SURGERY
6	THE TRINITY MEDICAL CENTER MEDICAL AND SURGICAL PROGRAM
7	UNIVERSITY HOSPITAL BLOODLESS MEDICINE AND SURGERY PROGRAM
8	OUR LADY OF RESURRECTION MEDICAL CENTER CENTER FOR BLOODLESS MEDICINE AND SURGERY
9	ST. JOSEPH HOSPITAL BLOODLESS SURGERY CENTER

Table II: an abridged list of some medical and surgical procedures performed routinely in bloodless medicines and surgery hospitals as advertised in their corporate leaflets.

PLASTIC AND AESTHETIC SURGERY	ALL OBSTETRIC & GYNAECOLOGIC SURGERY
ORGAN TRANSPLANT SURGERY	VASCULAR SURGERY
ALL UROLOGIC SURGERY	ORAL & MAXILOFACIAL SURGERY
ALL ENT SURGERY	DENTISTRY
OPEN HEART SURGERY	FULL PAEDIATRIC AND NEONATAL CARE
ALL ORTHOPAEDIC SURGERY	MEDICAL & SURGICAL ONCOLOGY
NEPHROLOGY, DIALYSIS & TRANSPLANTATION	LASER ANGIOPLASTY
ENDOLUMINAL STENTING	

THE PRINCIPLES OF BLOODLESS MEDICINE AND SURGERY.

The principles upon which the practice of bloodless medicine and surgery are derived from, were based on the under listed premises and others.

Many patients refuse to accept blood transfusion for religious or other personal reasons. For legal and ethical reasons their fundamental human rights must be respected.

Some patients may not be able to receive blood either for some medical reasons (e.g lack of compatible blood etc) or inability to provide blood etc.

Some patients may refuse blood transfusions for fear of contracting blood transfusion transmissible infections such as transfusion hepatitis, HIV/AIDS etc. Similarly, their fears must be respected for ethical and medico-legal reasons.

That with meticulous preparation of a patient, skilled and meticulous intra-operative haemostasis and proper post-operative care, a good number of minor, sub-major and even some major surgical procedures can be safely and successfully undertaken without blood transfusion.

There is evidence to show that surgery may be safely performed at hemoglobin level of less than 6g/dl if blood loss is kept below 500mls¹¹.

Evidence based techniques have been developed that can improve patients haemoglobin status without blood transfusion¹¹.

Techniques and therapeutic agents are available to prevent and minimize blood loss to the barest minimum during surgical procedures^{12,13}.

Techniques have been developed to salvage patient blood during operations and re-transfuse same blood (auto-transfusion) into the same patient¹⁴.

Techniques have been developed to improve the oxygen delivery capacity of the blood without blood transfusion (Haemodilution techniques)^{15,16}.

Active research is ongoing for the development of artificial oxygen carriers (artificial blood)¹⁷.

PRACTICAL STRATEGIES AND TECHNIQUES EMPLOYED IN BLOODLESS MEDICINE AND SURGERY.

To ensure success of a bloodless medicine and surgery procedure the attending physicians and every other person involved in the care of the patient must perfectly understand and apply the principles, techniques and the strategies involved in the care of such patients.

Hospitals which undertake bloodless medicine and surgery program have standard operating procedures (SOP) which are strictly followed by all persons involved in the care of the patients. The components of such protocols are given are

Table III¹⁵: Protocols and techniques in the practice of bloodless medicine and surgery.

OBTAIN A WRITTEN INFORMED CONSENT.
DETAILED MEDICAL HISTORY OF THE PATIENT
DETAILED AND THOROUGH PHYSICAL EXAMINATION
DETAILED LABORATORY INVESTIGATIONS
PROPER PRE-ANESTHETICS EVALUATION
CHOICE OF ANAESTHETIC TECHNIQUES THAT MINIMIZE OPERATIVE BLOOD LOSS
PREOPERATIVE HAEMATOLOGICAL BUILDUP OF THE PATIENT
CHOICE OF SURGICAL TECHNIQUE THAT ENSURES VERY MINIMAL BLOOD LOSS
USE OF THERAPEUTIC AGENTS THAT PROMOTE HAEMOSTASIS
ENSURE METICULOUS HAEMOSTASIS DURING OPERATION
USE OF AUTO TRANSFUSION AND OTHER AUTOLOGOUS BLOOD MANAGEMENT TECHNIQUES AS APPROPRIATE
METICULOUS IMMEDIATE AND LATE POSTOPERATIVE PROCEDURES FOR THE EARLY DETECTION AND PROMPT MANAGEMENT OF POSTOPERATIVE BLEEDINGS

listed in Table III¹⁵ below.

The informed consent:

Just as it is, with all routine medical and surgical procedures a written informed consent from the patient or the registered next of kin (for patients who are not competent to do so) must always be obtained. It also confirms that the patient or the next of kin has voluntarily accepted therapy to be administered without the use of blood.

Detailed medical history: This is aimed at uncovering of any factor(s) in the patient's medical history that may predispose to the risk of intra-operative bleeding. These include history of anemia, hereditary or acquired bleeding disorders such as haemophilia, von- WillBrandt's factor deficiencies, G6PD- deficiencies etc. Others include history of alcohol abuse, chronic liver disease, use of anti coagulants (heparin, warfarin etc), anti-platelet agents (dipyridamole, low- dose aspirin etc) and the use of non-steroidal anti inflammatory agents.

Thorough physical examination:

A multi disciplinary physical check of the patient is conducted by various specialists to ensure that the patient is physically fit to under go the surgical procedure, uncover any factor(s) that may pose risk of intra-operative and post operative bleeding. In the pre-operative assessment of the patient, the primary surgeon, cardiologist, the pulmonologist, hepatologist, anaesthesiologists and the haematologist are all involved.

Laboratory investigations:

Very detailed laboratory investigations are carried out to determine the overall health status of the patient as well as detect any possible risk for a bleeding diathesis. Thus in addition to the routine tests specific hematologic tests to detect potential for haemorrhagic diathesis are performed.

These include bleeding time, clotting time, platelet count, prothrombin time (PT), partial thromboplastin time (PTT), von-WillBrandt's factor and other clotting factor assays, Glucose-6-phosphate dehydrogenase (G6PD) assay etc. Other relevant laboratory tests such as liver function tests,

kidney function tests, blood glucose profiles etc, are also performed.

Pre-operative haematologic build-up of the patient

In non-emergency cases sufficient effort is made to correct the the haemoglobin deficit of the patient before surgery. The methods available include dietary measures, use of oral haematinic agent's i.e. oral/parenteral iron, folic acid, vit, B12 and other B-complex vitamins as well as trace elements. Others include the use of Recombinant human erythropoietin¹¹ as well as auto transfusion of patients own blood harvested preoperatively.

Also pre-operative measures to minimize blood loss should be practiced. These include the restriction of frequent phlebotomies. Only absolutely essential blood sampling should be allowed. At the inception the team approach is adopted to decide on all the necessary blood samplings required, then the exact quantity of blood sufficient for those tests is sampled once. The common practice in most of our hospitals whereby, cadres of resident clinicians perform repeated blood samplings sometimes for conflicting indications is not acceptable in BLMS practice.

Pre-anaesthetic evaluation.

A detailed pre-preoperative evaluation of the patient by a multidisciplinary team of clinicians is an important pre-requisite for the success of a bloodless surgery program. The cardiovascular and pulmonary status of the patient must be assessed by the relevant specialist and all the necessary cardiovascular and pulmonary indices determined.

The consultant anesthesiologist in the same way evaluates to ascertain the suitability of the patient to anesthesia based on set criteria.

luates to ascertain the suitability of the patient to anesthesia based on set criteria.

The anesthesiologist(s) also determine the most suitable anaesthetic techniques that will minimize blood loss, improve oxygenation and circulation.

These include avoidance of general anesthesia where possible, use of tourniquets, spinal, and epidural anaesthesia. Others include the use of hyperbaric oxygen, hypothermic and hypotensive anaesthetic techniques^{18,19}.

Intra-operative measures:

During the surgery the surgeons adopt procedures and techniques that minimize bleeding and secure haemostasis. These include the use of minimally invasive laparoscopic surgery, cryosurgery, stereo-static radio surgery, Brady-therapy, conformal and intensity modulated radiation therapies (IMRT).

Scrupulous measures to ensure and secure haemostasis using surgical instruments such as electro-cautery, ultrasonic scalpels, argon- laser coagulator, radio- frequency thermal ablation and water jet dissector. Other devices in use include vascular clips, clamps, tacks and balloons.

Pharmacological agents that promote haemostasis such as traxenemic acid, aprotinin, epsilon aminocaproic acid, vasopressin etc can also be used as the need arise. Intraoperative autologous blood management techniques are also employed as indicated. These include auto -transfusion and haemodilution techniques.

AUTOLOGOUS BLOOD MANAGEMENT TECHNIQUES

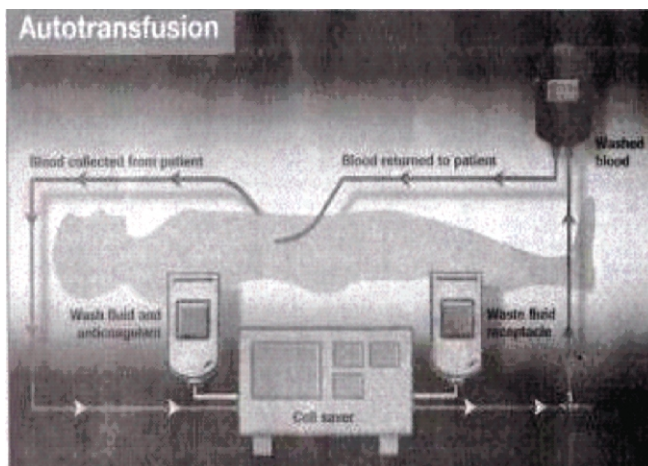
Definition:

Autologous blood management is a process whereby the patients own blood is manipulated in certain ways to be utilized for the same patient.^{14,15} . These techniques include the

Pre-operative banking of patients own blood for auto transfusion into the same patient peri-operatively.

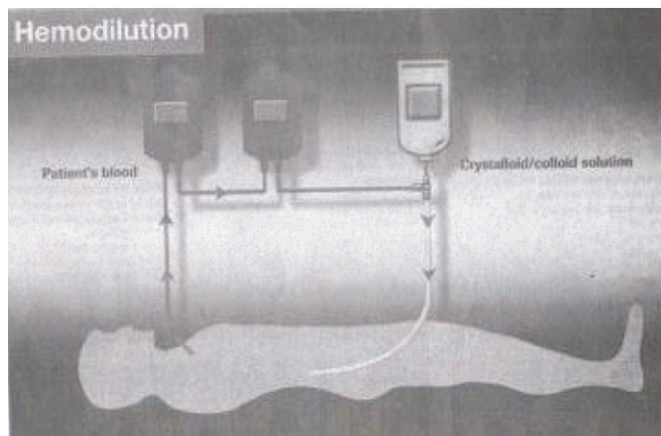
Autologous blood recovery and retransfusion intra-operatively. The process involves the recovery of blood from bleeding during surgery, washing and filtering the blood and auto transfuse same blood into the patient. (see fig.1)¹². The technique is very useful in procedures

Fig.1: Set up for Autologous blood transfusion.



Source: Hutchison AB, Fergusson D, Graham ID, et-al. Utilisation of technologies to reduce allogenic blood transfusion in the United States. Transfusion Medicine, 2001; 279-285.

Fig. 2: Set up for haemodilution.



Source: Hutchison AB, Fergusson D, Graham ID, et-al. Utilisation of technologies to reduce allogenic blood transfusion in the United States. Transfusion Medicine, 2001;

associated with massive intra-operative bleeding such as obstetric, gastroenterologic and oncology surgeries.

Intra-operative haemodilution techniques.

This is a process whereby the plasma volume of the patient's blood, through a deliberately controlled dilution technique is expanded without decreasing the total cell mass. In this way the blood volume is increased, the oxygen capacity of the plasma is increased, while the oxygen content of the red cell remains intact.

Two types of intraoperative haemodilution techniques exist. Acute normovolaemic (isovolaemic) haemodilution (ANH) and acute hypervolaemic haemodilution (AHH)^{15,16} respectively.

In acute normovolaemic haemodilution, a given amount of blood is withdrawn from the patient at the beginning of surgery and an equivalent volume of specially prepared replacement fluid is infused, thereby reducing the haematocrit but maintaining the total blood volume. At the end of the surgery the removed blood is auto transfused in to the patient.

In acute hypervolaemic haemodilution, specific volumes of special dilution fluid is continuously infused into the patient throughout the duration of the surgery thereby keeping the blood volume increased and the haematocrit low but within tolerable limits (see fig.2)¹².

THE POST OPERATIVE CARE.

The post operative management of the patient after bloodless surgery procedure is of cardinal importance in the determination of post-operative survival. A meticulous attention to minutest details, especially in the first 24-48 hours of surgery is mandatory. A multidisciplinary professional team approach is required to achieve this. The process involves close surveillance for early detection of post operative bleeding, prompt arrest of any bleeding employing all techniques available such as mechanical haemostasis, topical and systemic haemostatic agents etc. An early decision to operative haemostasis is mandatory. There should be no room for "wait and see" approach once a diagnosis of post-operative bleeding has been established.

Outside post-operative bleeding, anemia may occur in the late post operative period. This should also be taken seriously by applying all the modalities for the proper diagnosis of the anaemia and administering proper and adequate treatment to correct the anemia. The steps include, ensuring proper diagnosis, searching for and promptly and adequately treating post-operative sepsis. Others include adequate post operative nutrition with protein of high biological value. This may be delivered orally, by tube feeding, parenterally or by hyper alimentation. Depending on the individual patient's peculiar surgical circumstances iron and other haematinic supplements may be given orally or parenterally. Recombinant erythropoietin has been used successfully to boost the haematocrit levels in these situations¹¹.

From the presentation above it can be seen that the concept

and the practice of the bloodless medicine and surgery is real. The process has been developed and standardized and has become the standard of care for the Jehovah witness community. Also a large number of the members of the general public especially in the United States, Europe and Australia opt for bloodless medicine and surgery programs for personal reasons and for reason of the scare of HIV/AIDS and other blood borne infection.

As stated earlier virtually all types of minor, sub-major and major surgery are being undertaken under the bloodless and medicine program. From the foregoing what are the lessons for resource poor sub-Saharan African countries such as Nigeria? The evidence abounds for the strong need for resource-poor sub-Saharan African countries to adopt the practice of bloodless medicine and surgery as an integral part of their health care delivery systems.

Firstly, the demand for blood for transfusion far outstrips the available supply of blood for transfusion due to a number of factors such as the general unwillingness of people to donate blood freely. The fear of HIV/AIDS stigmatization and the unethical commercialization of blood donation is another major contributory factor which limits the availability of blood and blood products. As a unit (450mls) unethically donated commercial blood can be sold about for seven to eleven thousand naira (about 58 to 71 US-dollars) in Nigeria. Sometimes a patient may require more than one or several units of blood depending on the clinical situation. This puts an enormous financial burden on the patients and their family.

The risk of transmission of HIV-infection through blood transfusions given the high prevalence rate of HIV /AIDS in these populations is another major reason for the promotion of BLMS. Such risk is real given the fact that the blood screening process, especially in the sub-Saharan countries, may not be very efficient, especially with the problem of infection which may be undetected during the window period²⁰ using the widely available screening methods, remains valid especially in an endemic region.

Thirdly, the problems of high rate of delays, postponement and outright cancellation of several scheduled surgeries and procedures due to unavailability of blood also makes it imperative for the BLMS to be adopted in Nigeria as this situation will be reduced to a barest minimum under the bloodless medicine and surgery program.

Fourthly, the technology for the practice of bloodless medicine and surgery is simple, relatively inexpensive and readily within the reach of most resource poor countries. Thus the overall cost of the bloodless medicine and surgery program is much less than blood dependent program.

Developing bloodless medicine and surgery program in resource poor sub-Saharan African countries.

There are established guidelines and protocols^{21,22} for the development of the bloodless medicine and surgery program which hospitals and National/Regional Governments can adopt with local modifications.

Developing bloodless medicine and surgery program in any country requires genuine commitment, the political will and the conviction for its necessity bereft of any religious sentiments. The bloodless medicine and surgery program is not for the sole service of the JW group anymore, but for the generality of humanity.

The establishment of a National body such as a "National bloodless medicine and surgery Agency" at the level of the National Ministry of health will be in a good step in promoting and sustaining the BLMS program.

Such a body shall establish the necessary frame work and guidelines for the planning, pilot implementation, full scale implementation, evaluation and continuous monitoring of the program nationwide. In addition the required legislation to give the agency a perpetual and corporate status with relevant provisions to address the ethical and human rights issues of the scheme at Federal and state levels is advocated. It is also recommended that health care institutions especially at tertiary and secondary levels (i.e Teaching & Specialist hospitals) establish "bloodless medicine and surgery units" to run the programs in their institutions. Such a unit should preferably be headed by a senior consultant surgeon to work with a multi-disciplinary team of surgeons, anaesthesiologists, obstetrician/gynaecologists, cardiologists, pulmonologists, life support experts, haematologists and experienced theatre nurses.

Training and the retraining of all staff that will work in the program should be undertaken in centers where the bloodless medicine and surgery programs are active.

All necessary equipment for the program should be acquired and end-user staff actively trained on their utilization in order to ensure optimal, proficient and efficient service delivery. The presence of an active and fully functional intensive care unit is a mandatory requirement for a successful bloodless medicine and surgery program. Due to relative unavailability of standard and functional intensive care units which is major requirement for a BMS program, it is proposed that the programs should be initially limited to specialist and teaching hospital level, until full consolidation is attained. Doctors and other healthcare staff from the secondary care facilities can then undertake training in the specialist and teaching hospital until they acquire the necessary competence and proficiency before the program can take-off at the secondary care levels.

CONCLUSIONS

The Jehovah Witness strong religious insistence in the refusal of blood transfusion threw up challenges to the American medical community. Instead of merely dismissing the JW as mere heretics the American medical community saw it as a challenge, in the spirit of the inalienable rights of man. Today the challenges have become a huge opportunity for humanity. Virtually any type of medical and surgical intervention, such as open heart surgery and other complex procedures are successfully undertaken under the bloodless medicine and surgery programme both for the benefit of the JW and non-JW populations.

Quoting James Isbister²³ in a lead article in the Medical Journal of Australia, titled "Why haven't we learnt our

lesson?" He said, "A blood transfusion was previously seen as the gift of life, but the tables have been turned. The general perception now is that bloodless surgery and avoiding blood transfusion may be the gift of life."

With the increasing difficulties in accessing free blood for transfusion, the raging HIV/AIDS epidemic (which at present is only temporarily contained through donor fund driven activities in all sub-Saharan African countries) it becomes imperative for sub-Saharan African countries' health policy decision makers and medical care givers to embrace the Bloodless medicine and surgery programme as an integral part of their health care delivery systems.

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