APPENDIX -X

LIST OF PUBLICATION:

1. A study to assess the knowledge regarding umbilical cord blood banking among staff nurses in selected hospitals, Bangalore, published in An international multi disciplinary half yearly research journal Galaxy- link,ISSN-2319-8508,impact factor 4.361,vol:VI(1),nov-april-2017-18,170-176.

2. A descriptive study to assess the knowledge on premenstrual syndrome among the selected college of nursing students, Bangalore, published in An international multi disciplinary half yearly research journal Galaxy- link,ISSN-2319-8508,impact factor 4.361,vol:VI(1),nov-april-2017-18,72-78.
TOOL- STRUCTURED QUESTIONNAIRE

Dear respondent,

You are requested to read each question carefully and give a correct response by placing tick mark against the options provided.

SECTION I: DEMOGRAPHIC VARIABLES

1. Age
   a. 21 – 25 years
   b. 26 – 30 years
   c. 31 – 35 years
   d. 36 years and above

2. Gender
   a. Male
   b. Female

3. Professional qualification
   a. General nursing and midwifery
      b. Basic B.Sc Nursing
      c. Post basic B.Sc Nursing
      d. Lab assistant

4. Work experience
   a. 1-5 years
   b. 6 –10 years
   c. 11-15 years

5. Previous knowledge about placental stem cell collection
   a. Yes
   b. No

6. If yes, Source of information
   a. Family
   b. Friends
   c. Media
      b. Continuing nursing education
SECTION II: QUESTIONNAIRE RELATED TO KNOWLEDGE ON PLACENTAL STEM CELL

I. Anatomy and physiology

1. The meaning of placenta is
   a. Organ for mother's survival
   b. Organ for fetal survival
   c. Organ with no function
   d. Not an organ

2. The main function of placenta is
   a. Respiration, nutrition, storage, excretion
   b. Only storage
   c. Only excretion
   d. Mother's circulation

3. Placenta is originated from the
   a. Embryo
   b. Cell
   c. Chorionic membrane
   d. Tissue

4. The normal weight of the placenta at term is
   a. 1/6 of baby weight
   b. 1/10 of baby weight
   c. 1/15 of baby weight
   d. 1/20 of baby weight

5. The umbilical cord is the life line between the
   a. Placenta and the mother
   b. Fetus and placenta
   c. Fetus and mother
   d. Placenta and fetal membrane

6. The length of umbilical cord is about
   a. 30 cm
   b. 40 cm
   c. 50 cm
   d. 60 cm

7. The entire cord is cushioned by a soft substance called
a. Amnion
b. Wharton`s jelly
c. Placenta
d. Chorion

8. Wharton`s jelly helps the umbilical cord in
   a. Prevent obstruction
   b. Protect placenta
   c. oxygenated blood
   d. deoxygenated blood

9. Umbilical cord has
   a. 1 artery and 1 vein
   b. 1 artery and 2 veins
   c. 2 arteries and 1 vein
   d. 2 arteries and 2 veins

10. The fetal arteries in the umbilical cord carries
    a. Oxygenated blood from placenta to fetus
    d. Oxygenated blood from fetus to placenta
    c. Deoxygenated blood from fetus to placenta
    b. Deoxygenated blood from placenta to fetus

II. General information on stem cells
11. Stem cells are referred as
    a. Cells able to regenerate into other cells.
    b. cells not able to regenerate
    c. Humoral immune response
    d. Melanin- producing cells

12. Stem cells are body`s master cells because
    a. It create all other tissues, organs and system in our body.
    b. develop into other cell type
    c. reproduce into RBC and WBC
    d. Multicellular organism

13. The stem cells that can differentiate into any type of specialized cells are
a. Totipotent cells.
b. Pluripotent cells.
c. Multipotent cells.
d. Unipotent cells.

14. Stem cells are used to treat
   a. Malignant diseases
   b. Non-malignant diseases
   c. Both malignant and non-malignant diseases
   d. None of above

15. Stem cells are commonly found in
   a. Umbilical cord and placental blood
   b. Peripheral blood
   c. Bone marrow
   d. All of above

16. Stem cells are primarily used in
   a. Transplant medicine
   b. Herbal medicine
   c. Homeopathy
   d. Ayurvedic medicine

17. The stem cells which can differentiate to form only one kind of differentiated cell types are
   a. Pluripotent cells.
   b. Totipotent cells.
   c. Multipotent cells
   d. Unipotent cells.
SECTION III: Questionnaire related to practice on placental stem cell collection and its utilization

I. General information on stem cell

1. The blood vessel for collecting stem cell is
   a. Vein
   b. Artery
   c. Both
   d. None of above

2. Placental blood is also known as
   a. Maternal blood
   b. Umbilical cord blood
   c. Fetal blood
   d. Peripheral blood

3. Stem cells derived from placental blood are unique because
   a. They are the youngest
   b. They are fully developed
   c. They are mature
   d. They are easily available

4. In bone marrow transplantation, it is difficult to match between the donor and the recipient as it requires
   a. A perfect match
   b. A half match
   c. No match
   d. Imperfect match

5. Graft versus host disease (GVHD) refers to
   a. Allogeneic transplant
   b. Autologous transplant
   c. Autoimmunity
   d. A transplant rejection

6. Allogeneic transplant refers to
   a. Patient receive cells from their own body
   b. Patient receive cells from someone else
   c. Xenograft
   d. Split transplants
7. The advantage of placental stem cell are
   a. treat hematopoietic and genetic disorders
   b. Only hematopoietic disorders
   c. Only genetic disorders
   d. None of the above

II. Collection, storing and transplantation
8. The procedure for placental stem cell collection is
   a. Preservation
   b. Therapy
   c. Cryopreservation
   d. Normal storage

9. placental stem cell banking refers to
   a. stores stem cell
   b. stores organ
   c. stores menstrual blood
   d. stores sperms

10. First stem cell transplant performed in 1988 was on a five year old boy suffering from
    a. Fanconi’s anemia
    b. Leukemia
    c. Diabetes
    d. Neuroblastoma

11. The charges collected by private placental stem cell banks are for
    a. Collection, processing and storage
    b. Collection and processing
    c. Storage only
    d. Processing only

12. The first public placental stem cell repository in India was established at
    a. Reliance life sciences (RLS)
    b. Baby cell India
    c. Cryo –save (India) Pvt.Ltd
    d. Cord life science (India) Pvt.Ltd

13. Stored placental stem cells remain viable for a period of
a. 2 years  
b. 5 years  
c. 8 years  
d. More than 10 years

14. The first private stem cell bank in India is  
a. Life cell India  
b. Reliance life science Pvt. Ltd.  
c. Nanog India Pvt. Ltd.  
d. Stem one biological Pvt. Ltd.

15. Stem cell registry, observes cord blood awareness month in  
a. July  
b. September  
c. October  
d. December

16. An individual’s right for access to placental stem cells after storing in private bank is  
a. Full rights are preserved  
b. Decided by private bank  
c. The company owns the cells  
d. Not guaranteed

17. The collected blood unit after slow cooling is frozen at a temperature of  
a. $-100^\circ C$  
b. $-150^\circ C$  
c. $-196^\circ C$  
d. $-200^\circ C$

18. In cryopreservation, slow freezing process is important  
a. To keep the cells alive  
b. To prevent immediate freezing  
c. To keep the cells healthy  
d. To help in regeneration

19. The agent used for storing blood by cryopreservation method is  
a. Liquid nitrogen
b. Ethylene glycol  
c. Propylene glycol  
d. DMSO (Dimethyl sulfoxide)  

20. Placental stem cell collection should be done within  
   a. 5 minutes of giving birth  
   b. 15 minutes of giving birth  
   c. 20 minutes of giving birth  
   d. 10 minutes of giving birth  

21. The cryopreservative agent used to protect stem cells from damage due to freezing process is  
   a. DMSO (Dimethyl sulfoxide)  
   b. Heparin  
   c. Hespan  
   d. Ethylene glycol  

III. Health professionals responsibility  
22. The required amount of blood needed for transplantation surgery is  
   a. 70 ml  
   b. 75 ml  
   c. 80 ml  
   d. 85 ml  

23. Red blood cell depletion refers to  
   a. Removal of excess RBC  
   b. Destruction of RBC  
   c. Addition of RBC  
   d. Separation of RBC from WBC  

24. The nurse should ensure that collection of maternal blood is for  
   a. Infectious disease testing  
   b. Storing with the cord blood  
   c. Adding to the cord blood  
   d. None of above  

25. The consent should be obtained from  
   a. Mother
b. father  
c. Both parent  
d. grandparent

**ANSWER KEY**

**SECTION II**

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Respected Madam/ Sir,

Kindly go through the content and place a tick mark (√) against the items in the following columns provided ranging from very relevant to not relevant, if not relevant and needs modification; kindly give your valuable opinion in the remarks column.

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**Section-I Demographic Performa**

1. Age

2. Gender

3. Professional qualification

4. Work experience

5. Previous knowledge

6. If yes, Source of information

**Section-II**

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SUGGESTIONS:______________________________
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___________
Signature of the Valuator
COPY OF LETTER REQUESTING PERMISSION TO CONDUCT RESEARCH STUDY

From
Laishram Dabashini Devi
Ph.D Scholar
JJT University
Rajasthan

To
The Medical Director
……………………………..
Bengaluru

Respected Sir,

Sub: Permission to conduct research Study in your esteemed Hospital

I am a Ph D scholar in Nursing under JJT University, Rajasthan. I have selected the topic “A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS, BENGULURU” for thesis to be submitted to JJT university, Rajasthan, as a partial fulfillment of Ph.D in Nursing.

I kindly request you to grant me permission to conduct a research Study for health professionals for a period of……………… at your esteemed Hospital, Bengaluru.

Thanking you,

Yours sincerely,

Laishram Dabashini Devi
LETTER SEEKING CONSENT FROM THE RESPONDENTS

Date:

Dear Respondent,

I am a Ph.D scholar in Nursing under JJT University, Rajasthan. I have selected the topic "A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS, BENGULURU" for thesis to be submitted to J JT university, Rajasthan, as a partial fulfillment of Ph.D in Nursing.
If you consent to be a respondent in this study, I kindly request you to answer all the questions asked in the questionnaire. I assure you that your information papers will not carry your identity and all answers will be kept confidential.
Therefore, I kindly request you to put your signature in this space provided below, notifying your consent to participate in this study.

Thanking you,

Yours sincerely,

[Laishram Dabashini Devi]

I am willing to participate in this study conducted by Laishram Dabashini Devi

______________________________________________________________
Signature of the respondent
COPY OF LETTER SEEKING EXPERT’S OPINION FOR TOOL VALIDATION.

From,

Date:
Laishram Dabashini Devi
Ph.D scholar
JJT University,
Rajasthan
To,

------------------------------
------------------------------

Respected Madam,

Subject: Requesting expert opinion and suggestion for Tool validation.

I am a Ph D scholar in Nursing under JJT University, Rajasthan. I have selected the topic “A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS, BENGULURU” for thesis to be submitted to JJT University, Rajasthan, as a partial fulfillment of Ph.D in Nursing. I am herewith sending a copy of tool for its content validation.

I kindly request you to examine the tool and give your valuable opinion and suggestions for further improvements.

I would be highly obligated and remain thankful for your great help.

Thanking you
Yours faithfully,
Laishram Dabashini Devi
CONTENT VALIDITY CERTIFICATE

This is to certify that the tool constructed by Laishram Dabashini Devi, Ph.D scholar in JJT University, Rajasthan is validated by undersigned and can proceed to conduct the study for thesis entitled —A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS, BENGULURU.

Place: Bengaluru

Date:

Name and Signature of the Expert with Designation
Ref.: 

From
Laishram Dabashini Devi
Ph.D Scholar
JIT University
Rajasthan

To
The Medical Director
SRL SAI RAM HOSPITAL
Bengaluru

Respected Sir,

Sub: Permission to conduct research Study in your esteemed Hospital

I am a Ph D scholar in Nursing under JIT University. I have selected the topic "A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS, BENGULURU" for thesis to be submitted to JIT university, Rajasthan, as a partial fulfillment of Ph.D in Nursing.

I kindly request you to grant me permission to conduct a research Study for health professionals, for a period of 2.1.2018 to 3.3.2018 at your esteemed Hospital, Bengaluru.

Thanking you,

Yours sincerely,

Laishram Dabashini Devi

[Signature]
Ref.:

From
Lalshram Dabashini Devi
Ph.D scholar
JIT University
Rajasthan

To
The Medical Director
BHARATH NURSING HOMES
Bengaluru

Respected Sir,

Subject: Permission to conduct research Study in your esteemed Hospital

I am a Ph.D scholar in Nursing under JIT University. I have selected the topic "A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS,BENGULURU" for thesis to be submitted to JIT university, Rajasthan, as a partial fulfillment of Ph.D in Nursing.

I kindly request you to grant me permission to conduct a research Study for health professionals for a period of 01.02.2018 to 28.02.2018 at your esteemed Hospital, Bengaluru.

Thanking you,

Yours Sincerely,

Lalshram Dabashini Devi
Ref.:

From
Laishram Dabashini Devi
Ph.D Scholar
JIT University
Rajasthan

To
The Medical Director
SEKAR KRISHNA SEVASHRAM HOSPITALS
Bengaluru

Respected Sir,

Sub: Permission to conduct research Study in your esteemed Hospital

I am a Ph D scholar in Nursing under JIT University. I have selected the topic “A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS, BENGALURU” for thesis to be submitted to JIT university, Rajasthan, as a partial fulfillment of Ph.D in Nursing.

I kindly request you to grant me permission to conduct a research Study for health professionals for a period of 01-01-2018 to 31-01-2018 at your esteemed Hospital, Bengaluru.

Thanking you,

Yours sincerely,

Laishram Dabashini Devi

[Signature]

[Seal]
Ref.: 

From
Laishram Dabashini Devi
Ph.D Scholar
JIT University
Rajasthan

To
The Medical Director
SAGAR HOSPITALS
Bengaluru

Respected Sir,

Sub: Permission to conduct research Study in your esteemed Hospital

I am a Ph.D scholar in Nursing under JIT University. I have selected the topic "A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICE ABOUT PLACENTAL STEM CELL AND ITS UTILIZATION AMONG VARIOUS HEALTH PROFESSIONALS IN A SELECTED HOSPITALS, BENGALURU" for thesis to be submitted to JIT University, Rajasthan, as a partial fulfillment of Ph.D in Nursing.

I kindly request you to grant me permission to conduct a research Study for health professionals for a period of 04.11.17 to 30.11.17 at your esteemed Hospital, Bengaluru.

Thanking you,

Yours sincerely,

Laishram Dabashini Devi

24.11.2017

[Permission Stamped]
LIST OF EXPERTS FOR THE CONTENT VALIDATION OF THE TOOLS

1. Dr Anupama K. Oka
Professor,
Hinduja College of Nursing, Mumbai.

2. Dr K. Lalitha
Professor & Principal, Dayananda Sagar University
College of Nursing Sciences, Bengaluru

3. Dr Fathima Lateef
Dean & Principal
Gangothri Academy of Nursing Education, Bengaluru

4. Dr D. Mythili
Professor, Regional Institute of Mental Health & Neuro Sciences
NIMHANS, Bengaluru

5. Dr Mohini Gore, MBBS, MD, Ph.D
Asst Professor, Dayananda Sagar University
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Preface
A self instructional module is a self contained learning package, which include material necessary for learning of particular topic.

INTRODUCTION: In human being, the umbilical cord carries nutrient rich blood and gases to the fetus through the arteries and veins it encloses. After delivery, a major portion of the umbilical cord is discarded, and the smaller portion left attached to the infant is allowed to dry off. also can generate Research in recent times indicates that the blood contained in the umbilical cord or Umbilical Cord Blood is rich in “Stem Cells”. These are the building blocks of the blood and the immune system. These biologically unique cells have the ability to develop into other types within the body. Stem cells collected from the umbilical cord have the ability to replace bone marrow and to produce various blood and immune cells.

REVIEW OF ANATOMY AND PHYSIOLOGY OF PLACENTA AND UMBILICAL CORD
Placenta is a unique, autonomous and transient organ which is responsible for maternal fetal exchanges and maternal tolerance of fetopaternal antigens. The development of the placenta begins at implantation of the blastocyst, persists for the whole gestational period. The main function of the placenta are nutrition, gas exchange, endocrine, waste removal and immune support for the developing fetus and it will be delivered with the fetus at the birth. The placenta is a feto maternal organ with two components, fetal and maternal parts. The two portions are held together by the anchoring villi that are anchored to the deciduas basalis. The maternal part comprises of uterine
vessels and glands along with deciduas basalis. The fetal part by the chorionic plate, made up of amnion, extraembryonic mesenchyme, cytotrophoblast and syncytiotrophoblast. The peripheral part of the placenta consists of basal plate and is composed of embryonic tissue and maternal tissue.

The umbilical cord or funis forms the connecting link between the fetus and the placenta through which the fetal blood flows to and from the placenta. It extends from the fetal umbilicus to the fetal surface of the placenta.

It has two arteries that carry blood away from the fetus and one vein that returns blood to the fetus. The umbilical arteries and veins are coiled within the cord to allow them to stretch and prevent obstruction of blood flow through them. The entire cord is cushioned by a soft substance called Wharton’s jelly to prevent obstruction due to pressure.

The two fetal arteries carry deoxygenated blood and waste products away from the fetus to placenta, where these substances are transferred to the mother’s circulation. The umbilical vein carries freshly oxygenated and nutrient laden blood from the placenta back to the fetus.

It is about 50 cm in length with an usual variation of 30-100cm. Its diameter average 1.5 cm with variation of 1-2.5cm. Its thickness is not uniform but presents nodes or swelling at places. These swellings(false knots) may be due to dilatation of the umbilical veins or local collection of Wharton’s jelly.

**STEM CELLS:** Stem cells are biological cells found in all multicellular organisms that can divide through mitosis and differentiate into diverse specialized cell types and can self renew to produce more stem cells. Stem cells are the body’s master cells because they create all other tissues, organs and systems in our body.

The stem cells found in cord blood are the building blocks of our blood and immune system and most readily reproduce into RBC, WBC and Platelets.
Umbilical cord blood is a rich and abundant source of hematopoietic stem cells. The remaining volume of fetal blood within the placenta and umbilical cord following the birth of a baby has become recognized as an important resource for these life-saving cells. The sources for hematopoietic stem cells are embryonic (early cleavage or blastocyst stage), fetal (from 8th week of gestation onwards) umbilical cord blood or adult stem cells.

CLASSIFICATION OF STEM CELLS
Stem cells may be classified into various types based on their potential.
1. Totipotent cells can differentiate into any type of specialized cell (forms fetus and placenta) e.g. zygote and blastomers of an embryo.
2. Pluripotent cells (meaning many potential) are derived from primitive cells during early embryonic development like the inner cells mass of the blastocyst or the genital ridge of the 8-10 week old embryos. They can develop into all cell types except trophoblastic cells i.e. they cannot form a placenta.
3. Multipotent cells are the adult stem cells found in various organs of our body and have limited potential of differentiation e.g. hematopoietic stem cells found in bone marrow, cord or peripheral blood.
4. Unipotent cells which can differentiate to form only one kind of differentiated cell types e.g. spermatogonial stem cells only differentiate to produce sperm.

SCOPE
There are over 75 different malignant and non malignant diseases which can be treated by umbilical cord blood stem cells for example:
1. Hematological cancers and hemoglobinopathies
2. Diabetes
3. Cerebral Stroke
4. Parkinson’s disease
5. Application in plastic Surgery
6. Rheumatoid arthritis
7. Severe cell immunodeficiency disorders
8. Myocardial infarction
9. Alzheimer’s disease
10. Corneal problems
11. Cirrhosis of liver
12. Muscular Dystrophy

**BENEFITS OF STEM CELLS:**

- a limitless supply
- ready availability for immediate use
- painless risk free collection
- higher proliferative capacity
- lower risk for transmitting infectious disease
- lower risk of acute graft vs. host disease

**USES OF STEM CELLS**

Currently stem cells are primarily used in transplant medicine to regenerate a patient’s blood and immune system after they have been treated with chemotherapy and or radiation to destroy cancer cells. At the same time the chemotherapy and radiation destroy the cancer cells in a patient, they also destroy stem cells. Therefore, an infusion of stem cells or stem cell transplant is performed after the chemotherapy and or radiation treatment. The stem cells then migrate to the patient’s bone marrow where they multiply and regenerate all of the cells to create a new blood and immune system for the patient.

**MEANING OF PLACENTAL AND CORD BLOOD:**

It refers to the blood that remains in the umbilical cord and placenta following birth and after the cord is cut. It is also called “Placental Blood”.

**UNIQUENESS OF PLACENTAL AND CORD BLOOD DERIVED STEM CELLS:**

Umbilical stem cells have some additional important advantages that are sometimes lost or reduced in adult stem cells:

- They are “young”: being only a maximum of 9 months old, they have not suffered as much from the ageing process, often divide quicker and are more viable compared to adult stem cells.
- They are “fresher”: protected by the mother’s womb from many of the viruses and infections in the open world they are less likely to be contaminated or affected by diseases.
- They are “more naive”: they are less likely to cause complication in allogeneic transplant than adult stem cells.
ADVANTAGES OF PLACENTAL AND CORD BLOOD OVER BONE MARROW

- Easier to match and higher survival:
  
  Bone marrow is difficult to match between the donor and recipient because a perfect match is usually required. Cord blood immune cells, however, are less mature than in bone marrow and can be successfully used even when there is only a half-match. This means that there is more opportunity for transplants between family members when cord blood is stored.

- Immediate availability:
  
  Banking cord blood ensures that these stem cells can be immediately available if they are needed for treatment. Early treatment of many illnesses can minimize disease progression.

- Less GVHD (graft versus host disease):
  
  Umbilical cord blood derived stem cells are at least as effective as bone marrow stem cells, both in autologous and allogeneic transplants. When patients receive cells that have been donated by someone else, these transplant are called allogeneic treatments, and the cells are called allogeneic cells. When patients receive cells that come from their own body then it is autologous cells. In allogeneic transplants, umbilical cord blood derived stem cells are less likely to be rejected as compared with bone marrow derived cells so significantly less Graft vs. Host Disease (GVHD), a transplant rejection that is the leading cause of death in stem cell transplant patients.

PLACENTAL AND CORD BLOOD BANKING:

- A cord blood bank is a facility which stores umbilical cord blood for future use.

- A cord blood bank is a center whose mission is to maintain a supply of cord blood for therapeutic use in transplantation.

INCIDENCE OF PLACENTAL AND CORD BLOOD BANKING:

Ten of thousands of families have chosen to save their baby’s cord blood stem cells with cord blood registry. Most of the clients have no family history of disease, but see the current and future potentials of their newborn’s cord blood stem cells as a biological resource. There is 50% chance of a perfect
match for a parent and 25% chance for a perfect match for a sibling. There have been over 15,000 cord blood transplants worldwide through 2009.

**HISTORY OF PLACENTAL AND CORD BLOOD TRANSPLANT:**

The first cord blood transplant was performed in 1988. It was performed on a 5 year-old Parisian boy in Paris, France who was suffering from Fanconi’s anemia, using his newborn sister's HLA-matched umbilical cord blood. To date, the recipient is alive and well and free of disease. This achievement began an new era in umbilical stem cell transplantation. Since this first successful transplantation over ten years ago, there have been over 500 umbilical cord transplants worldwide, mostly involving children as recipients. The cord blood registry(CBR) observes cord blood awareness in month of July.

**IMPORTANCE OF PLACENTAL AND CORD BLOOD BANKING:**

A newborn’s placenta and umbilical cord blood used to be considered to be little more than post-childbirth waste material. These days, parents and researchers understand the potential of placenta and cord blood stem cell preservation. Placenta and cord blood banking can provide families with more stem cells than cord blood banking alone. The use of stem cells are being studied in treating potentially life-threatening diseases and conditions. Cord blood banking is like an insurance to a child’s future. Umbilical cord blood transplants can be as effective as bone marrow transplants in adult patients with leukemia. One of the unique characteristics of cord blood cells are under developed. So, there is no problem if the cells do not match with that of patients body unlike in the case of bone marrow. Cord blood cells can be used by siblings and other relatives in families where bone marrow cannot. It is easy to retrieve and easily available. More and more parents are choosing to bank their new born baby’s cord blood as it is a once in a life time opportunity which will act as a life saver of the child and the family as well.

**TYPES OF PLACENTAL AND CORD BLOOD BANK:**

Researchers now urge parents to store or donate the Umbilical Cord Blood to specialized “Cord Blood Banks”. These can be either public or private institutions.

- **Private Cord Blood Banks**
This system is run by individuals or private organizations. The organization will store the Cord Blood irrespective of medical reasons. There are charges for collection and storage. The advantage of this system is that blood from a healthy child with no inherited diseases can be maintained as insurance, in case a family member or the child itself should need it in the future.

- **Public Cord Blood Banks**

  The first ever Cord Blood Bank in the world was started in New York’s Milstein National Cord Blood Center. It is a Public Cord Blood Bank. This system is usually government run. There are generally no charges for collection and storage. Public banks accept donations to be used for anyone in need. However, there are very strict regulations which public banks need to follow in order to enable the donated units to be added to a registry. Generally, an expectant mother interested in donation should contact the bank before the 34th week of pregnancy. Once the blood is donated, it loses all identifying information after a short period of initial testing. Families are not able to retrieve their own blood after it has been donated.

  The disadvantage of this system is that it is not always guaranteed that the donor will receive Cord Blood should he or she need it. It may have been donated. However, matches may be found from among many other donated samples.

  The match referred to is required between the donor’s and recipient’s HLA antigens. The closer the match is, the better is the body’s chance of accepting the new stem cell.

  Today, there are over 40 Cord Blood Banks worldwide, both public and private.

**PLACENTAL AND CORD BLOOD BANKING FACILITIES IN INDIA:**

The first cord blood repository in India was established by the company Reliance Life Sciences(RLS), which incorporated in 2001. Their programme is primarily oriented towards public banking.

Private banks are as follows:

1. Baby cell India
   
   OFFICE: Mumbai, India
   
   STORAGE: Pune, Maharashtra, India

2. Cord Life Sciences (India) Private Limited
OFFICE: Kolkata, West Bengal, India.
STORAGE: Kolkata, West Bengal, India.
3. Cryobanks International India
HEADQUARTERS + STORAGE: Gurgaon (Haryana), India.
4. Cryo-Save (India) Pvt. Ltd.
OFFICE: Bangalore, India.
STORAGE: India.
5. International Stem cell Services Ltd.
OFFICE: Bangalore, India.
STORAGE: India.
6. LifeCell India
OFFICE: Chennai, India
STORAGE: Chennai, India
COMMENT:
LifeCell was the first private cord blood bank in India, which has a birth rate of 25 million per year, and the first to be accredited by AABB. (American Association of Blood Banks)
7. Nanog India Pvt. Ltd
OFFICE: Pune, Maharashtra, India
STORAGE: Stem One Biologicals in Pune, India; BioVault in Plymouth, UK
8. Reliance Life Sciences Pvt. Ltd.
OFFICE: Dhirubhai Ambani Life Sciences Center, Mumbai, India
COMMENT:
Reliance established South Asia's first cord blood repository offering both public donation and family storage.
9. StemCyte India Therapeutics Pvt. Ltd.
OFFICE: Ahmedabad, India
STORAGE: Apollo Hospital Campus, Gujarat, India
10. StemOne Biological Pvt. Ltd.
OFFICE & STORAGE: Pune, Maharashtra, India

ETHICAL AND LEGAL ISSUES:
The collection of tissue from one individual for therapeutic use in another individual involves not only technical and medical issues, but also ethical and legal issues. Donors of cord blood are not merely depositing the leftover by-
products of the birth process with interested researchers and physicians; rather, they are making a choice to do something that may potentially benefit either unknown beneficiaries or members of their own families. Pregnant women receive a great deal of information sometimes conflicting about the donation process and the consequences of different types of banking. It is crucial to disclose several kinds of information to the potential donor, including who has access to the cord blood once it is donated, where it is stored, how it is stored, and how the donor`s privacy is protected.

• Cord blood collection centres should have clear policies about who must provide consent for donation and a plan in place to address paternal objections to the donation of cord blood

• Informed consent for the collection, storage, and use of cord blood should be obtained before labour and delivery, and after the adequate disclosure of information.

• The information provided to a donor must include a balanced perspective on the different options for banking.

• Secure links between the medical records of the donor and the banked cord blood unit must be established to ensure the safety of transplantable products and the patients receiving the transplants. These records must be kept confidential and afforded the full protection of the law. If an abnormality is discovered during testing, the results must be delivered to the donor in a manner that is appropriate in relation to the severity of the abnormality.

• Those who collect cord blood for public banks should disclose to potential donors all possible clinical and research uses of the cord blood and, furthermore, that donation will terminate a prospective donor’s ability to direct the use of the cells.

PROCESSING PROCEDURES

Screening Maternal Donors and Cord Blood

• In most cases, a mother will register with a bank prior to giving birth. Upon adequate completion of the informed consent the mother`s obstetrician is informed of her wish to be a donor, and arrangements are made to collect the cord blood.
Cord blood acquisition must be done carefully because of the potential presence of transmissible diseases or pre-existing genetic conditions and possible contamination with maternal cells and microbial agents.

Once consent for the collection of cord blood has been obtained an extensive behavioural history and physical examination are undertaken to determine whether the mother is likely to belong to a group that engages in a behaviour that might pose a health risk to the recipient of the banked cord blood unit (e.g., risky sexual behaviours or illicit drug use).

In addition, maternal and family histories for inherited genetic disorders are taken.

The unit is screened for bacterial, viral, and fungal infections through culturing specimens obtained from the unit before it is frozen.

**Collection of Cord Blood Units**

check-in of the collection kit and cord blood bag. bar coded labels assigned specifically for each cord blood unit are used on the cord blood collection bag and throughout the process so the cord blood stem cells can always be identified. the cord blood bag is weighed to estimate the volume of cord blood.

cord blood collection happens after the umbilical cord has been cut and is extracted from the fetal end of the cord, diverting up to 75 +/- 23 ml from the neonate. it is usually done within 10 minutes of giving birth. after sterilization of the umbilical cord to minimize the possibility of contamination a large bore needle is used to drain the cord blood which is placed into a closed bag containing an isotonic anticoagulant at a neutral ph. it is generally performed by obstetrical staff (e.g. the physician, nurse, or midwife) as part of the delivery procedure.

there are several methods for collecting cord blood. the method most commonly used in clinical practice is the “closed technique”, which is similar to standard blood collection technique. With this method, the technician cannulates the vein of the severed umbilical cord using a needle that is connected to a blood bag, and cord blood flows through the needle into the bag. on average, the closed technique enables collection of about 75 ml of cord blood.
Additional stem cells may be collected from the placenta via placenta cord banking. After the health care provider draws the cord blood from the placental end of the umbilical cord, the placenta is couriered to the stem cell laboratory, where it is processed for additional stem cells. An adequate cord blood collection requires at least 75 ml in order to ensure that there will be enough cells to be used for a transplantation.

**COLLECTION OF CORD BLOOD UNIT**

**Storage**

After the collection, the cord blood unit is shipped to the lab and processed, and then cryopreserved. Cryopreservation is the standard practice for long-term storage of cord blood units for transplantation. The entire, unprocessed unit is generally not frozen, as storage in a liquid nitrogen freezer is quite expensive and the maximization of storage space is important. Various processing methods that reduce the volume required for storage but that maintain the viability of the cells in the finished product have been identified.
These processes have been designed to remove the cells not needed for successful engraftment, leaving the desired transplantable stem cell material available for storage. A plasma volume expanding medium (e.g., Hespan or Pentaspan) is added to the unit to facilitate separation of the red cells from the white cells containing the progenitor cells needed for engraftment. The units are then centrifuged to remove excess red blood cells as it have no benefit when transplanted and may lead to complications if they remain in the cord blood stem cell unit upon transplant. This process is called red blood cell depletion. This will reduce the unit to a volume more suitable for efficient long-term storage. After re-suspension and additional centrifugation, the plasma is extracted to reduce the volume to about 20 ml. A 10 percent DMSO (Dimethyl sulfoxide) solution is added as a cryopreservative to protect the cells from damage as a result of the freezing process. After the unit is slowly cooled to -90 Celsius, it can then be stored in a liquid nitrogen tank which will keep the cord blood unit frozen at -196 Celsius where they remain until they are ready to be used for transplantation. The slow freezing process is important to keep the cells alive during the freezing process.

NURSES RESPONSIBILITY

- Educate the potential mother/donor about public and private cord blood banking so that she can make an informed choice regarding the volunteer donation of her infant’s cord blood.
- Obtain informed consent from every mother/donor by providing information and discussion of the consent form, culminating with a written and signed document.
- Obtain a detailed medical history from mother/donors following delivery and informed consent. Record information on the Medical History Form and accurately enter into CCB database.
- Obtain delivery and neonatal information by reviewing the medical records of the mother and infant donor, and accurately record information on the appropriate form, performing follow up with OB clinical staff when needed.
- Perform final reviews on all paperwork leaving the collection site, ensuring accuracy and completeness of all recorded information before forwarding it to the Collections Site Coordinator.
• Ensure delivery of the informed consent, medical history, and delivery information forms to the CCB laboratory and administrative offices for verification and inclusion into the cord blood unit files.
• Ensure that collection of maternal blood samples is for infectious disease testing. If samples are not collected or are otherwise unusable, facilitate the collection of new samples.
• Collect the umbilical cord blood from either the delivered or the undelivered placenta according to collection procedures and deliver to the CCB processing laboratory for processing and storage.
• Ensure and maintain complete confidentiality with regard to identity of the maternal/infant donor pair, as well as results of any tests and procedures, in accordance with CCB standard operating procedures.

SUMMARY:
We have dealt about review of anatomy and physiology of placenta and umbilical cord, stem cells, its classification, scope, benefits of stem cells and uses of stem cells. We have also dealt about placental and cord blood, advantages over bone marrow, cord blood banking, incidence of placental and cord blood banking, history of cord blood transplant, importance and its unique characteristics. Types of placental and cord blood banking were also dealt, differences between private and public cord blood of cord banks, ethical and legal issues and processing procedure and nurses responsibility were also discussed.

CONCLUSION:
Although there are many benefits of placental and cord blood, these fascinating stem cells are continued to be discarded as a medical waste even today due to lack of knowledge and negative attitude caused by the high cost involved. It is our responsibility to create an awareness about placental and cord blood banking and motivate its utilization by the general public.
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