

6.1.5 Umbilical Cord Blood Banking

Transplants of umbilical cord blood have been recommended or performed to treat a variety of conditions. Cord blood is also a potential source of stem and progenitor cells with possible therapeutic applications. Nonetheless, collection and storage of cord blood raise ethical concerns with regard to patient safety, autonomy, and potential for conflict of interest. In addition, storage of umbilical cord blood in private as opposed to public banks can raise concerns about access to cord blood for transplantation.

Physicians who provide obstetrical care should be prepared to inform pregnant women of the various options regarding cord blood donation or storage and the potential uses of donated samples.

Physicians who participate in collecting umbilical cord blood for storage should:

- (a) Ensure that collection procedures do not interfere with standard delivery practices or the safety of a newborn or the mother.
- (b) Obtain informed consent for the collection of umbilical cord blood stem cells before the onset of labor whenever feasible. Physicians should disclose their ties to cord blood banks, public or private, as part of the informed consent process.
- (c) Decline financial or other inducements for providing samples to cord blood banks.
- (d) Encourage women who wish to donate umbilical cord blood to donate to a public bank if one is available when there is low risk of predisposition to a condition for which umbilical cord blood cells are therapeutically indicated:
 - (i) in view of the cost of private banking and limited likelihood of use;
 - (ii) to help increase availability of stem cells for transplantation.
- (e) Discuss the option of private banking of umbilical cord blood when there is a family predisposition to a condition for which umbilical cord stem cells are therapeutically indicated.
- (f) Continue to monitor ongoing research into the safety and effectiveness of various methods of cord blood collection and use.

AMA Principles of Medical Ethics: I, V

Background report(s):

CEJA Report 3-A-16 Modernized *Code of Medical Ethics*

CEJA Report 9-I-07 Umbilical cord blood banking

CEJA Report 4-A-94 Fetal umbilical cord blood

6.1.5 Umbilical Cord Blood Banking

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Physicians who participate in collecting umbilical cord blood for storage should: [new content clarifies primary audience for guidance]

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REPORT OF THE COUNCIL ON ETHICAL AND JUDICIAL AFFAIRS*

CEJA Report 9-I-07

Subject: Umbilical Cord Blood Banking

Presented by: Mark A. Levine, MD, Chair

Referred to: Reference Committee on Amendments to Constitution and Bylaws
(Jane C.K. Fitch, MD, Chair)

1 BACKGROUND: UMBILICAL CORD BLOOD

2
3 Umbilical cord blood is a potential source of stem and progenitor cells, which may eventually be
4 used to reconstitute tissue, organs, or entire systems. The first successful transplantation of
5 umbilical cord blood occurred in 1988, with the reconstitution of a 6 year-old child's blood, bone
6 marrow, and immune cells using his sister's cord blood. Since then, more than 6,000 unrelated-
7 donor cord-blood transplants have been done in 150 locations worldwide.¹ Cord blood transplants
8 have been recommended or performed for a variety of diseases including leukemias, lymphomas,
9 sarcomas, immune deficiencies, and some metabolic disorders.² The first public cord blood bank
10 was created at the New York Blood Center in 1991; other banks, both public and commercial,
11 entered the field in the 1990's and early 2000's. In 2004, the US Congress allocated \$20 million to
12 increase the stock of cord blood units in public banks.¹

13
14 Cord blood is collected by an obstetrician or other licensed practitioner, either before or after
15 delivery of the placenta. "In utero" collection is performed after delivery of the newborn but
16 before delivery of the placenta, "ex utero" after the delivery of the placenta.³ In both methods, the
17 umbilical cord is clamped at one end, a needle is inserted into the umbilical vein on the unclamped
18 end, and the blood is allowed to flow through the needle into a collection bag.^{1,4}

19
20 Public banks are non-profit agencies that receive cord blood by non-directed donation; the blood is
21 stored confidentially for use by the general population. Currently the National Marrow Donor
22 Program (NMDP) Center for Cord Blood has 45,000 units stored and registered.⁵ Commercial,
23 private banks, on the other hand, are for-profit entities that store blood for a fee charged to the
24 parents of the child. The blood is then available only at the direction of the parents, for autologous
25 transplantation or for transplant into a family member.¹

26
27 Cord blood transplantation offers a number of benefits to both individuals and society. The
28 outcomes of autologous cord blood transplantation are generally good, and the incidence of graft-

* Reports of the Council on Ethical and Judicial Affairs are assigned to the reference committee on Constitution and Bylaws. They may be adopted, not adopted, or referred. A report may not be amended, except to clarify the meaning of the report and only with the concurrence of the Council.

1 versus-host disease is “10-fold lower than that seen after transplantation with HLA-matched bone
2 marrow obtained from a sibling.”¹ Public cord blood banks increase the availability of
3 hematopoietic stem cells, particularly for ethnic groups underrepresented in bone marrow
4 registries. Private storage of cord blood may be one reasonable option for families with a known
5 history of genetic disease that can be alleviated by cord blood transplantation, or when a sibling or
6 other family member needs a stem cell transplant.⁴

7
8 **ETHICAL ISSUES IN UMBILICAL CORD BLOOD COLLECTION AND BANKING**

9
10 Informed Consent

11
12 A number of ethical considerations surrounding the collection and storage of umbilical cord blood
13 deserve careful attention. The first, and most basic, is the issue of informed consent. Previously,
14 umbilical cord blood was considered waste, and thereby was the property of the hospital to be used
15 as the institution saw fit (without the knowledge or consent of the mother).⁶ In recent years, the
16 necessity to inform patients if their cord blood is to be collected has been recognized,¹ but timing of
17 consent can be challenging.

18
19 Most practitioners agree that ideally, consent should be obtained before the onset of labor;
20 however, women often arrive at the hospital already in labor, with no prior knowledge of the
21 possibility of cord blood donation. This is a stressful time for parents, so obtaining a genuine
22 informed consent can be difficult.

23
24 A variety of consent procedures are currently used. Public banks usually seek consent during the
25 prenatal care period, but may ask for consent when a woman enters the hospital during labor or
26 may collect the cord blood without consent, obtaining consent after the collection is performed.⁷
27 After the onset of labor would not be an appropriate time for a physician to bring up private
28 banking.

29
30 Private banks usually secure written consent during the prenatal care period. Consent is sometimes
31 in the form of an online agreement to which a prospective customer must agree before obtaining
32 further services from the private facility.⁸ Such agreements are contractual in nature, and are a
33 poor substitute for in-person interaction with a health care professional to discuss the risks, benefits
34 and alternatives to the collection and storage of cord blood, as generally described in Opinion E-
35 8.08, “Informed Consent” in the AMA’s *Code of Medical Ethics*.⁹

36
37 The informed consent process for umbilical cord blood banking should include specific disclosure
38 of the collection process, the details of what will happen to the sample once it is collected, and the
39 spectrum of banking options that are available. When making a decision of whether or not to have
40 the cord blood collected and stored, a woman should understand that, due to complications during
41 childbirth, it may be in the best interest of the mother and child to forgo collection, and moreover
42 that sometimes not enough blood can be saved to constitute a usable sample. Furthermore, a
43 woman also should understand the need for additional testing for a variety of diseases and the
44 potential implications of the tests results, including the possibility that the cord blood sample will
45 not be stored if the sample does not meet certain criteria.^{6,10}

1 The informed consent process for donation to a public bank should include disclosure that the
2 sample will not be available for retrieval and use by family in the future, because donations to
3 public storage facilities may be used for transplantation to other patients or other testing or research
4 purposes.⁶ Additional disclosures should explain that the use of cord blood for clinical
5 transplantation is currently experimental and some of its clinical usage falls under the heading of an
6 investigational new drug (IND) by the Food and Drug Administration; thus, some units donated to
7 public banks may be used in experimental protocols.¹⁸

8 The consent process for private banking should provide information regarding the utility of
9 banking cord blood and the likelihood of future use. Though research on stem cells found in cord
10 blood promotes speculation about a variety of future uses, the most recent findings suggest that
11 there is only a 1 in 20,000 chance that a not-at-risk child would develop a condition which would
12 necessitate the use of his or her own cord blood.¹¹ Patients should also be informed that there exist
13 uncertainties whether long-term storage affects the future utility of cord blood.¹²

14 15 Claims Related to Medical Benefits

16
17 Sound informed consent is based on complete and accurate information presented to a patient.
18 Therefore, disclosure of risks, benefits, advantages, and disadvantages of banking blood in public
19 versus private banks is critical. The utility of autologous cord blood transplantation is a key selling
20 point used by private banks to aggressively market their services; yet, such blood has only limited
21 value, according to current evidence.

22
23 No current evidence suggests that cord blood can be used to treat illnesses resulting from injury or
24 aging. Furthermore, autologous transplantation is not the procedure of choice for some diseases for
25 which commercial banks recommend cord blood as a treatment option. According to the American
26 Academy of Pediatrics Work Group on Cord Blood Banking, the overall outcomes of autologous
27 transplantation in cases of leukemia, lymphomas, and neuroblastomas are no better than those of
28 allogeneic transplantation.² In fact, most forms of leukemia can be treated by conventional
29 chemotherapy, making autologous transplantation unnecessary.¹ Moreover, some private banks
30 claim storage of cord blood might one day save a child from leukemia, but leukemic or pre-
31 leukemic cells have been found in autologous cord blood samples from children presenting with
32 leukemia between the ages of 1 and 11, making samples unsafe to the original donor or to any other
33 potential recipient.¹

34
35 Commercial cord blood banks recruit customers by making general claims about the future health
36 of their children, for example, declaring that “banking your baby’s cord blood today could make a
37 major impact on your family in years to come”¹³ or “Collecting Cord Blood offers a once-in-a-
38 lifetime opportunity to obtain stem cells.”¹⁴ The probability of actually using this stored cord
39 blood, however, is negligible: estimates range from 1:1000 to 1:200,000, and no empirical evidence
40 favors widespread usage of autologous transplantation in the future.^{2, 15}

41
42 The number of hematopoietic stem cells transplanted may be important to the outcome of the
43 procedure. Consequently, parents may have paid for cord blood units to be stored which might be
44 insufficient to meet the needs of their children, particularly as those children mature and reach
45 adulthood when the number of cells needed for treatment is greater than the quantity needed to

1 treat newborns.^{1,2} Techniques are currently being developed to increase volume of cord blood in
2 order to make samples harvested from newborns usable for adults, but these processes are still
3 experimental and it may be years before they are refined enough for clinical use.³
4

5 Conflicts of Interest

6

7 An additional concern is physicians' financial ties to cord blood banks. Opinion E-8.03, "Conflicts
8 of Interest: Guidelines" states "Under no circumstances may physicians place their own financial
9 interest above that of their patients."¹⁵ In cord blood banking, conflicts of interest may arise in a
10 variety of circumstances. For example, physicians potentially can benefit from research with
11 financial implications.¹¹ Full disclosure of and consent for research intentions as well as any
12 potential commercial use that can lead to physicians' financial gains must be made to a potential
13 donor as detailed in Opinion E-2.08, "Commercial Use of Human Tissue."¹⁶
14

15 Physicians may have relationships with private cord blood banks that benefit them financially if
16 they convince their patients to store cord blood at the given facility. Private banks charge an initial
17 storage fee of between \$1,000 and \$1,500, and subsequent yearly fees are generally around
18 \$100.^{1,18,19} As stated in Opinion E-6.02, "Fee Splitting," accepting payment from a source for
19 referring parents to that source constitutes fee splitting and would violate the requirement to deal
20 honestly with patients and colleagues.²⁰
21

22 Concerns about the efficacy of autologous cord blood transplantation have led some to question the
23 need for private cord blood banks. In most cases it is inappropriate to recommend storage of cord
24 blood at a private facility.
25

26 Other Considerations

27

28 The timing of umbilical cord clamping is also important to consider. Collection procedures must
29 not interfere with standard delivery practices and the safety of a newborn or the mother. It is
30 unlikely that health care professionals will endanger the lives of newborns for the sake of cord
31 blood collection, but the risk remains. Still, parents might be paying for and/or accepting a practice
32 that could endanger the lives of their newborn children.²
33

34 Cord blood that is privately banked may engender questions of ownership. Though the parents of
35 the child will likely be paying the fees for storage, the question of whether the blood belongs to the
36 parent or child may be raised. Some private banks require parents to agree to general "Terms and
37 Conditions" which specify exactly when a child will receive ownership claims to his or her cord
38 blood sample, often at age 25, and what will happen to a sample if payment for storage is not made,
39 (the company "will retain all rights to the cord blood unit").⁷ In the absence of clear contractual
40 terms, there is uncertainty as to what should be done with a cord blood sample if a family stops
41 paying a private bank's storage fee.³ It has been suggested that abandoned blood could be used for
42 research purposes, as long as the donor's identity is kept confidential, but that it should be
43 considered unethical for the blood to be sold for therapeutic use.¹¹

1 Several ethical questions may arise involving the protection of the privacy of the donor mother and
2 child. Cord blood donations are tested for a variety of infectious diseases and genetic
3 abnormalities, and the question of who may be informed of the results of these tests (i.e., mother,
4 father, and child) may arise. A separate issue for public banks is whether or not a long-term link
5 between donor and donation should exist.³ Some concerns related to the privacy of the donor arise
6 when considering the safety of a sample for any given recipient. If identifying information is not
7 kept which can link a sample to its donor, then in the event a medical condition (e.g., leukemia)
8 appears later in the donor-child's life, the cord blood which would be unsafe could go unidentified
9 and remain in a public pool. Additionally, keeping a link to the donor could be beneficial to any
10 recipient if additional blood cells are needed; however, this link also poses a risk of violating
11 confidentiality of both the mother and child.

12
13 **CONCLUSION**

14
15 Treatments using umbilical cord blood stem cells have been successful and point to the possibility
16 of a great potential for treating a wider variety of people and diseases with cord blood in the future.
17 Thus, at this time it is appropriate to collect and bank this resource in order to make the supply as
18 diverse and as available as possible to the greatest number of patients for experimental therapy and
19 to researchers for continued exploration. Ethical concerns present themselves at various points in
20 the process of obtaining cord blood samples and careful consideration must be given to fully
21 informing potential donors of the full spectrum of options and their respective advantages as well
22 as disadvantages.

23
24 **RECOMMENDATION**

25
26 The Council on Ethical and Judicial Affairs recommends that Opinion E-2.165, "Fetal Umbilical
27 Cord Blood," be replaced with the following and the remainder of this report be filed.

28
29 **E-2.165 Fetal Umbilical Cord Blood**

30
31 Umbilical cord blood stem cells are useful for some therapeutic purposes. Physicians
32 providing obstetrical care should be prepared to inform pregnant women of the various
33 options regarding cord blood donation or storage and the potential uses of donated samples.
34 Collection procedures must not interfere with standard delivery practices and the safety of a
35 newborn or the mother.

36
37 Informed consent for the collection of umbilical cord blood stem cells should be obtained,
38 when feasible, before the onset of labor. Physicians' ties to public and private cord blood
39 banks must be disclosed during the informed consent process. Physicians shall not accept
40 financial or other inducements for providing samples to cord blood banks.

41
42 The utility of umbilical cord blood stem cells is greater when the donation is to a public
43 rather than private bank. Therefore, physicians should encourage women who wish to
44 donate cord blood to donate to a public bank if one is available. Doing so will result in
45 greater availability of stem cells to patients from minority populations.

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Private banking should be considered in the unusual circumstance when there exists a family predisposition to a condition in which umbilical cord stem cells are therapeutically indicated. However, because of its cost, limited likelihood of use, and inaccessibility to others, private banking should not be recommended to low-risk families.

Because safety and effectiveness of various methods of cord blood collection and use continue to evolve, physicians should monitor the results of ongoing research.

(New HOD/CEJA Policy)

Fiscal Note: Staff cost estimated at less than \$500 to implement.

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3. The small number of couples who might bear identical siblings solely for purposes of harvesting their tissue does not outweigh the benefits which might be derived from pre-embryo splitting. Additionally, it is not evident that a sibling would have negative psychological or emotional consequences from having acted as an organ or tissue donor. Indeed, the child may derive psychological benefits from having saved the life of a sibling.

To the extent possible, discussion of these issues should be had with gamete providers prior to pre-embryo splitting and freezing so as to inform the prospective parents of possible future ethical dilemmas.

(The Pre-Embryo Splitting Opinion will appear in the next edition of Current Opinions with Annotations as Opinion 2.145 and is derived from Principles I, III, IV and V of the Principles of Medical Ethics.)

4. FETAL UMBILICAL CORD BLOOD*

HOUSE ACTION: FILED

Human umbilical cord blood has been identified as a viable source of hematopoietic stem cells that can be used as an alternative to bone marrow for transplantation. It is obtained by clamping the umbilical cord immediately after delivery.

The use of umbilical cord blood raises three main ethical problems. First, the exact timing of the clamping has a significant impact on the neonate. Studies indicate that early clamping may cause an abrupt surge in arterial pressure, resulting in intraventricular hemorrhage (particularly in premature infants). Second, the parents of the infant may not realize the implications of the procedure and the potential risks involved. Third, there is a risk that the infant donor will develop a need for his or her own cord blood later in life. If that child was a donor and this later need arises, he or she might be without blood, when he or she could have had his or her own blood stored.

To avoid health risks, normal clamping protocol should be followed and not altered in such a way that might endanger the infant. To ensure appropriate informed consent, parents of the infant must be fully informed of the risks of the donation and written consent should be obtained from them.

The third concern, that the child may need the blood later in life, is more complex. The possibility that an infant donor would be in need of his or her own umbilical cord blood is highly speculative. There are a number of reasons why the infant may not need the blood later. The diseases that are treated by bone marrow transplantation are not common, and there may be other treatment alternatives available, particularly in the future when the illness would occur. Additionally, the demand for fetal umbilical cord blood will increase as it becomes medically certain that the blood may be used in persons unrelated to the donor. This situation will reduce the need to store a particular infant's blood since umbilical cord blood from other donors would be available. If the blood is sufficient for use in unrelated individuals, then the donor may obtain the cord blood from another donor later in life, making the need to store his or her own blood unnecessary. These original donors, however, should be given priority in receipt of such blood if they need a donation later in life.

For all of these reasons, it would generally not be unethical to use the cord blood. However, if the child-donor is known to be at risk for an illness that is treated by bone marrow donation, the child should not be used as a donor, and his or her blood should be stored for future use.

(The Fetal Umbilical Cord Blood Opinion will appear in the next edition of Current Opinions with Annotations as Opinion 2.165 and is derived from Principles I and V of the Principles of Medical Ethics.)