DOI: https://doi.org/10.5114/ait.2019.90991

The Jehovah's Witness obstetric patient – a literature review

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Abstract

The patient's right to refuse blood transfusion must be honoured in case of its clear expression. Some special pharmacologic and/or surgical procedures can be useful in a Jehovah Witness (JW) parturient. In case of excess blood loss the maintenance of peripheral tissue oxygenation is crucial. Only a few hospitals have equipment for blood salvage, and alternative oxygen carriers have potentially lethal side effects. Findings suggest that obstetric facilities should develop special algorithms of management in the case of the JW obstetric patient, with written declaration of which elements of blood are not acceptable for the patient, early diagnosis and intensive treatment of anaemia in pregnancy, administration of antifibrinolytic agents before surgery, use of electric surgical tools to restore haemostasis, early detection and aggressive treatment of excessive blood loss and, last but not least, close cooperation between obstetricians and anaesthesiologists, including sharing the information about the patient's refusal of blood transfusion.

Key words: pregnancy, blood, anaemia, labour, Jehovah's Witness.

Anaesthesiol Intensive Ther 2019; 51, 5: 390–403

Received: 26.10.2019, **accepted:** 23.11.2019

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To this day, haemorrhage, complicating up to 5% of labours, is one of the most common obstetric causes of morbidity and mortality in women [1]. Due to the speed of its development, peripartum haemorrhage can, in a very short time, lead to life-threatening hypovolaemic shock [2, 3]. Excessive blood loss requires comprehensive treatment to maintain peripheral tissue oxygenation, adequate volume of the intravascular compartment and coagulation [1]. In such circumstances there is an indication to transfuse red blood, plasma and platelets. Currently no other equally effective treatment is known.

Jehovah's Witness (JW) women are in a high obstetric risk group. British data indicate that in the UK the risk of death related to obstetric complications is 65 times higher in this group than in the general population; in the USA such risk is estimated at 44 times higher [1-5]. Russo *et al*., describing a case of a JW pregnant multipara after two caesarean sections with placenta praevia invading her urine bladder, found the risk of death to be 130-fold higher than in a patient who would accept blood transfusion [6]. It is estimated that every year 1000 JW die because of blood refusal [4].

HISTORICAL VIEW, ETHICAL AND MORAL DILEMMAS

By the rules of the Code of Medical Ethics, the physician is obliged to treat the patient according to their best will and knowledge; however, there are some situations in which, despite their best will and competence, physicians remain helpless because of the patient's refusal of treatment.

If such an objection derives from the patient's lack of knowledge leading to fear and dilemmas, there is still a chance to dispel the patient's doubts and convince them to accept therapy. The effectiveness of persuasion can depend on communication between both parties and their motivation to cooperate. Urgent situations, due to time limitations, may pose difficulties; however, consensus is still possible, if there is the slightest chance of discussion.

The patient's refusal of treatment stemming from their religious beliefs presents much more of a challenge. In such circumstances "the good of the patient" is often differently understood by those involved, where physicians tend to perceive it as a choice of the most effective and safe procedures, whilst patients prefer to stay within the boundaries of religious rules [4, 5, 7–10].

The Christian Congregation of Jehovah's Witnesses was established in 1872 in the USA. Nowadays, it has about eight million of followers. JW do not receive blood products. They equate blood transfusion with blood consumption, which would be contrary to biblical recommendations in Genesis ("Only flesh with its soul – its blood – you must not eat."), Leviticus ("You must not eat the blood of any sort of flesh, because the soul of every sort of flesh

is its blood. Anyone eating it will be cut off.") and Deuteronomy ("Just be firmly resolved not to eat the blood, because the blood is the life, and you must not eat the life with the flesh."). The faithful see refusal of blood transfusion as an act of obedience to God, which will guarantee them eternal life [3, 5, 11, 12].

The prohibition of blood transfusion amongst JW is generally considered characteristic and distinctive for the group, yet it was not established in the early days of the Congregation. It was established in 1945, caused by JW leaders' distrust of institutional medicine and their critical opinion about military service, as in those days blood transfusion was strongly associated with treatment of war wounds [4, 7]. The refusal of blood treatment worsened JWs' relationship with state institutions and society [2, 7, 9, 12]. Since 1961 reception of blood products has resulted in exclusion from JW congregation [5, 7, 10]. However, if the procedure has been carried out despite the patient's objections, the recipient may stay in the community and be supported by fellow believers. A JW patient who accepted blood products under pressure would be judged individually by the leaders [12].

As medicine developed, blood and plasma preparation became more and more nuanced, and JW gradually liberalized the transfusion ban. Today some blood products are acceptable for all JW, while others are to be considered by an individual patient [12] (Figure 1).

Some medical professionals might not be aware of the selectivity of blood product refusal in JW patients, but such refusal is obligatory for red blood, platelets and plasma [2–4, 8, 10, 11] (Table 1). Since 2000 the governing council of the congregation has allowed the faithful to independently decide about the use of so-called "small fractions of blood" with, inter alia, fibrinogen, albumins, clotting factor concentrates, as well as on the use of intraoperative blood salvage or erythropoietin administration [3, 4, 7] (Table 2).

There are reports in the literature on performing epidural blood patch in JW patients using a closed system of catheters, to allow blood collection and epidural injection without loss of continuity [15].

Decisions about procedures called, not quite correctly, alternative therapy, and possible organ donation or transplantation should also be made by the patients themselves [11].

A publication known as Advanced Directives, distributed among JW, contains detailed information on the subject (Figure 2). It may also be very useful as an official declaration of acceptable methods of treatment presented to medical professionals [1, 2, 7, 11].

Husarova *et al*. confirmed that the acceptance of blood products differs among pregnant JW women: while 32.8% of the study group declared not to take any component of blood despite circumstances, 7.9% agreed to use every blood product indicated. Nulliparas were more likely to accept such treatment than multiparas. Women who read advisory publications had less of and more selective objections about blood fractions. Ambulatory consultation with an explanation of risk, natural history and treatment of obstetrical haemorrhage changed decisions of 9.2% of JW women from orthodox to more liberal [8].

Ringnes *et al*. emphasize that JW inform their coreligionists about the availability and effectiveness of "alternative treatment" and so deny the risk of death, which leads to the illusion of safety and negates danger in emergency. Data, based on selected evidence about risk, side-effects and high cost of blood treatment, are highly exaggerated amongst this group. It is to strengthen biblical arguments and motivate JW patient to refuse transfusion when religious considerations are not enough [12]. For this reason any persuasion attempts can be perceived by the JW patient as oppressive and patronizing, if not as encouraging them to give up their religious principles [5, 7, 8].

On the other hand, the patient's resistance to the most effective and, sometimes, the only indicated treatment, causes disapproval amid medical professionals. Due to various medical, ethical and legal problems arising from blood refusal, JW patients are considered demanding and difficult, especially in urgent situations [3, 5, 8, 12, 18, 19]. The medical staff often struggle with cognitive dissonance because, despite having a diagnosis, and adequate knowledge, skills and tools, they must remain passive while the patient is getting worse, yet still opposing treatment [3–5, 7, 8, 10, 11, 19, 20]. Rollins

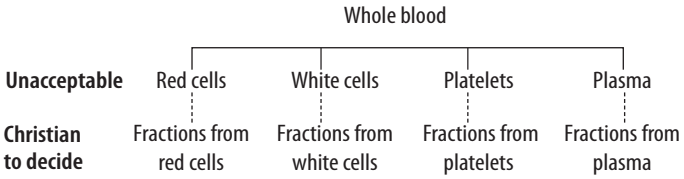


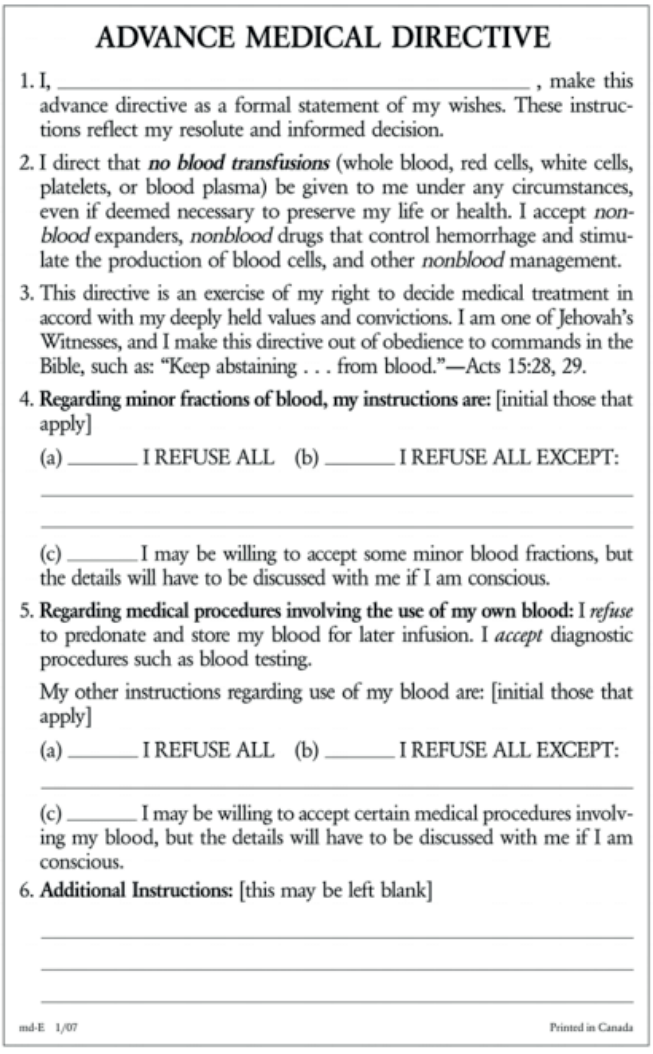
FIGURE 1. Classic Jehovah's Witness division of blood fractions; available at [13]

TABLE 1. Blood fractions' acceptability. According to: [14]

"Major fractions" – unacceptable	"Minor fractions" – patient to decide
Whole blood	Albumin
Plasma	Immunoglobulins
Red blood cells	Clotting factors
White blood cells	"Other": vitamins, waste, hormones
Platelets	Interferons
	Platelet fractions

TABLE 2. Acceptance and refusal of procedures by Jehovah's Witness patients. Adapted from: [16]

Procedure	Acceptance	Procedure	Acceptance
Allogeneic blood transfusion	No	Factor XIII concentrate	Individual decision
Preoperative autologous transfusion	No	Cryoprecipitate	Individual decision
Normovolaemic haemodilution	Yes	Recombinant activated factor VII	Individual decision
Intraoperative cell salvage with closed circuit	Yes	Antifibrinolytics	Yes
Recombinant human erythropoietin	Yes	Desmopressin	Yes
Fibrinogen concentrate	Individual decision	Haemoglobin solutions	Individual decision
Prothrombin complex concentrate	Individual decision	Perfluorocarbon emulsions	Yes



ADVANCE MEDICAL DIRECTIVE

1. I, _____ , make this advance directive as a formal statement of my wishes. These instructions reflect my resolute and informed decision.
2. I direct that ***no blood transfusions*** (whole blood, red cells, white cells, platelets, or blood plasma) be given to me under any circumstances, even if deemed necessary to preserve my life or health. I accept *nonblood* expanders, *nonblood* drugs that control hemorrhage and stimulate the production of blood cells, and other *nonblood* management.
3. This directive is an exercise of my right to decide medical treatment in accord with my deeply held values and convictions. I am one of Jehovah's Witnesses, and I make this directive out of obedience to commands in the Bible, such as: "Keep abstaining . . . from blood."—Acts 15:28, 29.
4. **Regarding minor fractions of blood, my instructions are:** [initial those that apply]

   (a) _____ I REFUSE ALL (b) _____ I REFUSE ALL EXCEPT:

   _____

   _____

   (c) _____ I may be willing to accept some minor blood fractions, but the details will have to be discussed with me if I am conscious.
5. **Regarding medical procedures involving the use of my own blood:** I *refuse* to predonate and store my blood for later infusion. I *accept* diagnostic procedures such as blood testing.

   My other instructions regarding use of my blood are: [initial those that apply]

   (a) _____ I REFUSE ALL (b) _____ I REFUSE ALL EXCEPT:

   _____

   (c) _____ I may be willing to accept certain medical procedures involving my blood, but the details will have to be discussed with me if I am conscious.
6. **Additional Instructions:** [this may be left blank]

   _____

   _____

   _____

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FIGURE 2. Blood refusal declaration available at [17]

et al. and Gyamfi *et al*. describe a traumatic experience of a medical team forced to assist a dying patient, who otherwise would be easily saved by blood transfusion [5, 8]. Ringnes *et al*. portray the relationship between JW patients and medical professionals as dominated by distrust [12].

Gutierrez-Vega *et al*. hold that the patient's objection to blood transfusion interferes with physician decision-making and increases the risk of a mistake, which can disadvantage the patient. In such circumstances, doctors are less willing to treat surgically, especially if the procedure is not life-saving. The need for surgery as the only effective treatment of a potentially lethal disorder, e.g. neoplasm, reduces the dilemma whether to qualify patients for this procedure [8, 20].

Zeybek *et al*. indicate two potential mistakes deriving from generalization and stereotypes about JW patients. The first one is a belief that JW patient would not accept any blood product, and the second concludes that blood refusal is identical with choosing death [4]. Gutierrez-Vega *et al*. warn that the patient's declaration of blood refusal must not lead to negligence of medical care [20].

Cognitive dissonance is not, however, experienced by medical staff only. It can also be shared by JW patients, who are taught the sanctity of every human life and the need for its careful protection, with simultaneous insistence on giving it up in potentially reversible danger [12]. Zeybek and Trivino report JW patients' apprehensions that the objection to blood transfusion would be understood as a refusal of any treatment, or to be used as an excuse for giving up therapy, or not implementing it entirely [4, 19]. According to Rollings *et al*., JW patients, for the same reasons, are afraid of disqualification from life-saving treatments. Still, surgery ward patients admit in a questionnaire that, in case of intraoperative haemorrhage, a surgeon should give up tumour removal and end the procedure [8]. Such statements, of course, have no power in obstetrics, since caesarean section or surgical restoration of haemostasis cannot be discontinued.

To illustrate a perception of JW by medical professionals in Germany, Rajtar demonstrates JW patients' reports. In the very same paper, the state of JWs' knowledge about alternative therapies is presented, unintentionally revealing their uncritical conviction about the effectiveness of the use of erythropoietin instead of blood transfusion in every case [7].

Rajtar, Gohel *et al*. and Rollins *et al*. accentuate positive aspects of JWs' attitude towards blood

transfusion, taking it as an inspiration for development of alternative therapies, such as so-called bloodless surgery, as well as a sign of respect for patient rights. Ringnes, on the other hand, appears to be critical of this point of view, presuming JW to overestimate their merits for medicine development [7, 8, 12, 18].

Trivino [19] noted that JW patients may not only be sceptical about blood transfusion, but that there is a general expectation for intraoperative blood loss reduction amongst them. She asked whether the use of expensive alternative therapies in JW would not diminish the budget for the other patients.

LEGAL ASPECTS OF PATIENT'S BLOOD REFUSAL

Most authors agree that the patient's objections should be honoured even without the presence of any rational arguments for such a decision, under the condition that the patient is of sound mind and thoroughly informed about alternative treatment and perspectives [5, 8, 11]. A verdict given by the state court of appeal in the USA is an example of an insufficient solution to the problem. It states that a pregnant woman of age and sound mind, capable of conscious decision-making, can refuse blood transfusion for religious reasons, unless it brings danger to the child or interferes with a normal course of labour and delivery [4].

According to art. 9 of the Convention for the Protection of Human Rights and the Dignity of the Human Being against the Applications of Biology and Medicine "account must be taken of the wishes previously expressed by the person concerned regarding medical intervention if he is unable to express his will at the time it is carried out" [21].

In contrast, Gutierrez-Vega *et al*. [20] quote resolutions of the Brazilian Federal Council of Medicine and Regional Council of Medicine of the State of Rio de Janeiro, clearly imposing on medical practitioners the duty of providing blood transfusions, even against one's wishes, when the patient's life is at stake. In light of these documents, the physician cannot be forced to proceed against the rules and medical knowledge.

Gohel *et al*. and other authors share the opinion that in the case of an unconscious patient with life-threatening bleeding, the physician who is thus not able to receive clear information about potential blood refusal must act in the best interest of the patient, that is protection of their life and health [3, 11].

Petrini presents the point of view of Italian law in two cases. The first concerns a Jehovah's Witness taken to the Accident & Emergency department of a hospital in Trento due to multi-organ trauma following a road accident. Tue fully competent patient declared his refusal of blood treatment, which was included in his history. Because of deterioration of his condition, the patient underwent surgery. During surgery physicians consulted the Public Prosecutor on the telephone and were authorised to perform blood transfusion. T.S. subsequently sued for moral damages for having been forced, against his will, to receive a blood transfusion that he had expressly refused. The Court of Trento dismissed the claim. The patient took his case to the Court of Appeal, which declared the appeal unfounded. The Court of Cassation in decision n. 4211 of 23rd February 2007, accepted almost *in toto* the motivations of the Court of Appeal. It was specifically emphasised that the original dissent, expressed before the patient's clinical condition worsened and he became unconscious, had been manifested in non-life-threatening circumstances. Quoting The Supreme Court, in "very different clinical conditions, with the patient's life in immediate danger and with no means of consulting the patient anew as he was by then under total anaesthesia", the doctors acted legitimately. The Court held that this did not run counter to Article 9 of the Convention on Human Rights and Biomedicine [22].

Another case concerned an unconscious Jehovah's Witness who was brought to a hospital in Pordenone. He had a "No blood" card, but received a blood transfusion. The subsequent legal process ended when the Supreme Court recognised that, bearing in mind the Hippocratic Oath, the physicians had acted correctly in giving the transfusion and could not "logically presume the real "resistance" of a patient's religious convictions in the face of a sudden life-threatening event" [22].

Lifesaving blood transfusion in children is acceptable under some conditions, even against parents' will [3, 11, 23]. Bester *et al*. consider the issue of teenage JW patients, where a double consent for medical procedures is needed, signed both by the patient themselves and by their parent. The authors recommend disregarding sole underage patients' objections to blood transfusion in life-threatening condition [24]. Gyamfi *et al*. warn against honouring unconfirmed suggestions coming from the patient's relatives. They emphasize that when an adult patient in need of blood is not able to communicate and his objection to blood transfusion is not documented, the decision should be sought via the court of law [5].

Polish legislation does not regulate clearly pro futuro declarations of will. Such a declaration is an equivalent to the consent or refusal of a particular procedure. It can take the shape of either a formal document or an informal note, under condition that it is clear, explicit and doubtless.

As Żelichowski notes, the principle of respect for patient autonomy requires that his will must be honoured, irrespective of the motives (confessional, ideological, health, etc.), so the patient's lack of consent for a specific procedure is binding for the physician and abolishes criminal or civil liability.

On August 18, 2004, B.Ł. suffered a traffic accident, as a result of which she lost consciousness and required a transfusion of blood and blood products because of injuries. Her "Healthcare Statement – No Blood", dated on January 6, 2004 implied that, "under all circumstances", she would not agree to "any form of blood transfusion", even if it was necessary to use it to save health and life, but she would take non-blood drugs that increase plasma, drugs that stop bleeding, and agents that stimulate red blood cell production, and she agreed to other alternative "no blood" treatments. The District Court, relying on information about the patient's health status provided by medical professionals, authorized the performance of transfusion of blood and its preparations to save her life. After recovery, the patient sued the hospital for acting against her will. The Supreme Court allowed B.Ł.'s complaint. In the justification of its ruling, the Supreme Court concluded: "One of the manifestations of the individual's autonomy and the freedom of his choices is the right to decide about himself, including the choice of treatment method. The reflection of this right is the institution of consent to perform a medical procedure, which is one of the prerequisites for the legality of therapeutic activities. For this reason, the Act on the Medical Profession stipulates that a physician may conduct an examination or provide other health services, subject to the exceptions provided for in the Act, after the patient's consent; still, this rule does not apply directly to pro futuro statements, although similar regulations already exist in many countries (*Patiententestament*, *testament de vie*, living will, advanced directives)".

As a consequence of these arguments, the Polish Supreme Court also made a statement that the patient's clear "pro futuro" statement in case of loss of consciousness, specifying the will regarding medical procedures in therapeutic situations, is binding for medical professionals [25].

On 21.08.2006 the Irish High Court ruled that doctors in Dublin Coombe Maternity Hospital could force a JW suffering from life-threatening postdelivery haemorrhage to have a blood transfusion despite her refusal on personal and religious grounds, and that staff could restrain the patient if she physically attempted to stop doctors administering the life-saving blood transfusion and clotting agent. The judge justified the decision with the interests of the patient's newborn child, who would be left with no family in the country in case of his mother death. The trial caused a controversy among JW, who accused the judgement to overturn the landmark Supreme Court decision made in 1996 about the "right to die" [26].

According to Polish law, in case of a blood transfusion performed against a JW will, the patient is entitled to initiate voluntarily three types of proceedings: criminal, civil and disciplinary. In criminal proceedings, the evidence of an offense specified in art. 192 § 1 of the Penal Code is necessary, i.e. the patient's disagreement with a therapeutic procedure. The sanction for performing a medical treatment without the consent of the authorized person is a fine, restriction of liberty from 1 month to 12 months or imprisonment for up to 2 years.

JW also have the right to civil proceeding and compensation for violation of their freedom to self-determination and freedom of conscience. In such a situation, they will be entitled to a claim for compensation or payment of a certain sum of money for a given social purpose (Article 24 § 1 of the Civil Code).

A complaint to the District Professional Ombudsmen operating at regional medical chambers is another type of proceeding. The complaint should relate to unethical behaviour or professional misconduct. Disciplinary proceedings consist of explanatory proceedings, proceedings before a medical court and enforcement proceedings. The court may order: warning, reprimands, a financial penalty, a ban on performing managerial functions in health care organizational units for a period of one to five years, limiting the scope of activities in the exercise of the medical profession for a period of six months to two years, suspension of the right to practice the profession for a period of one to five years and, at most, deprivation of the right to practice the profession [27].

Trivino quoted a verdict of the Spanish Constitutional Court in the case of a JW patient who applied for reimbursement of medical expenses in private facility, because an alternative therapy was not available in a state hospital. The consideration whether constitutional freedom of religion makes the faithful free to demand untypical medical service was given, followed by a conclusion that the state system of medical care cannot serve "a la carte" therapy [19].

In many countries, JW committees are established to cooperate with medical facilities. The committee members mediate between patients and medical staff, and, in some cases, influence the choice of a favourable doctor [3, 7, 11]. In the USA, there is a 24-hour advisory institution available to JW patients and medical staff alike. Some JW congregations have a list of doctors who agree to treat blood-refusing patients [12].

PRENATAL CARE: INFORMATION FLOW ASPECT

The aim of prepartum or preoperative management in a patient declining blood transfusion is to maximize the safety of the parturient and her offspring [3]. Many authors agree that getting information about the patient's objection to blood treatment as early as possible it is of utmost importance. Zeybek *et al*. present some additional factors, apart from blood refusal, that are likely to increase the risk of death: severe anaemia, over 45 years of age, non-European non-Maori ethnicity, body mass exceeding 90 kilograms, urgent admission to the hospital, hypertension, arrhythmia, ischaemic heart disease, former myocardial infarction, valvular dysfunction, haemodialysis and haemoglobin concentration at time of admission at 8 g dL^{-1} or lower [4]. Belaouchi *et al*. recommend including pregnant JW women in the peripartum high risk group, and informing medical staff about the patient's refusal of blood [28].

As Gyamfi *et al*. observed, respecting the patient's autonomy is not only an obligation arising from the law, but the very basis of trust and adequate patient-doctor relationship. The authors strongly recommend physicians to consider whether to take prenatal care of a pregnant JW, who naturally can be a high risk patient, and to document this decision, that is include it in the patient history [5].

Kidson-Gerber and Gyamfi recommend asking the pregnant woman about unacceptable methods of treatment as soon as the first ambulatory visit, and documenting the answer [1]. They advise consulting such patients in presence of the head of the department and, finally, giving them an authorised document or a magnetic card confirming refusal of blood transfusion; this makes patient identification much easier in ambulatory and hospital care setting [3, 5].

Gyamfi, Cole and other authors emphasize selectivity of JW refusal to use blood products and they recommend interviewing patients very carefully with regard to this aspect, as well as documentation in the form of list of substances signed as acceptable or not acceptable [5, 10]. They also show a suggested form of consent to autologous blood transfusion and intraoperative blood saving. It is advisable to conduct such discussions in the presence of the patient and medical staff only, for others present can influence the patient's decision, which, in turn, may lead to declarations made under moral pressure [5]. Ringnes *et al*. describe a JW habit of accompanying patients to support them in case a decision about blood transfusion should be made [12].

Belouchi *et al*., who work in a reference centre for blood-declining patients, recommend giving patients pre-labour consultation in a verbal and written form, where written information includes benefits and risks of different types of treatment, and asking patients to fill in a questionnaire to clarify their preferences and objections to therapy. Patients should also receive detailed written information about no-blood procedures [28].

ACOG's guideline published in 2015 contains a proposed list of blood products possible to mark as "acceptable", "not acceptable" or "acceptable in particular circumstances", as shown below (Figure 3). Unfortunately, the authors did not define "particular circumstances", so we can only guess they mean life-threatening situations [29].

Husarova *et al*. accentuate the opportunity to educate patients through explanation of benefits and risks of different methods of obstetric complications treatment [1]. Kidson-Gerber and Gyamfi recommend warning the patient about the risks of obstetric haemorrhage and letting them know that the risk of death or severe complications is much higher in case of "alternative" no-blood treatment [3, 5]. Last but not least, Gyamfi *et al*. suggest informing patients of the high cost of such procedures. It can be an important argument in the USA, given health insurance expense [5]. Consistently with ACOG recommendations, the authors oblige medical staff to inform patients that severe uterine bleeding in a blood-refusing patient often requires hysterectomy as the only effective treatment, and the procedure must be undertaken at an early stage of haemorrhage [5, 29]. Gohel *et al*. present suggested informed consent forms for medical procedures, with a detailed explanation of possible consequences of the patient's decisions, including high risk of adverse outcomes in case of blood refusal [11].

What is not always remembered but may be crucial to obtain the patient's consent for the procedures is the need to adapt the communication method to the patient's level of education. In 2002 Bergman reported that of the 30 sects ranked, JW have the smallest number of college graduates [30]. Lipka warns that, compared with other religious groups, JW are less educated. A majority (63%) of adult JW in the USA have no more than a high school diploma [31]. As the Pew Research Centre reports, in the USA only 9 percent of JW get an undergraduate degree, which is the lowest result of any faith group. JW leaders discourage secular education as spiritually dangerous for it can erode religious beliefs and values [32].

In Poland JW declare that, from their point of view, education is necessary. At the same time they emphasize the importance of "a balanced view of education", assuming that spiritual education is more valuable than secular, because only Bible-based spiritual education is a source of life-saving knowledge about God. JW also believe that the

BLOOD PRODUCT ACCEPTANCE LIST PATIENT ID :.....

My signature below indicates that I request no blood derivatives other than the ones which I have designated in this consent to be administered to me during my hospitalization.

My attending physician, ... MD has reviewed and fully explained to me the risks and benefits of the following blood products and methods for alternative non-blood medical management and blood conservation available to me.

My attending physician, ... MD has also fully explained to me the potential risk associated with not authorizing blood or non-blood management during my hospitalization.

	Acceptable	Non-acceptable	Acceptable under certain circumstances
Category I			
Red blood cells			
Fresh frozen plasma			
Platelets			
Autologous banked blood			
Cryoprecipitate			
Category II (contains human plasma)			
Albumin			
Fibrin glue			
Fibrinogen concentrate (RiaSTAP)			
RhoGAM			
Plasma protein fractions/Plasmanate			
Human immunoglobulin			
Factor 8/vWF concentrate (Humate-P and Wilate)			
Prothrombin complex concentrate			
Bebulin (3 factors)			
Kcentra (4 factors)			
Category II (does not contain human plasma)			
Factor 7A (Novo 7)			
Factor 8 recombinant			
Factor 9 recombinant			
Factor 13 recombinant (Tretten)			
Category III (no blood component)			
Tranexamic acid			
Amicar			
DDAVP			
Erythropoietin – recombinant			
Hetastarch			
Balanced salt solutions			
Category IV			
Isovolemic hemodilution			
Hypervolemic hemodilution			
Cell saver			

Signature: Date: Time:

FIGURE 3. Blood product acceptance list. Adapted from [29]

social environment at universities or similar higher education centres may pose a moral and spiritual threat. For this reason, many of them decide not to expose themselves or their children to the influence of such places [33].

Rollins, Gohel and other authors emphasize the necessity of careful documentation of the patient's declarations in the history [5, 8, 11]. Kidson-Gerber *et al*. recommend documenting the patient's decision according to the regulations of a given country

and standards of a particular medical centre [3]. As Gyamfi *et al*. point out, an important part of collected medical documentation is inclusion of the patient's last will and appointment of guardians for children in case of death [5].

Many authors emphasize the significance of giving information about the patient's blood refusal to the medical staff, in ambulatory care as well as in a hospital ward, and most importantly, in a delivery or operating room. Such information lets the staff familiarise themselves with the patient, assess their risk of severe anaemia, plan the procedures and discuss them with the patient.

Hubbard, Rollins and other authors recommend discussing the patient's objections to therapeutic methods and letting them know what risks rejection of certain methods entails. The authors believe it to be crucial that the information about a high risk pregnant patient should be provided not only to all obstetricians, but also to anaesthetists, neonatologists and haematologists. Such knowledge is vital in case of acute severe bleeding [2, 8, 11, 18]. ACOG guidelines state that a medical team should be informed immediately when a blood-refusing patient is admitted to the hospital. If severe blood loss is possible, other specialists should also be warned [29].

PRENATAL CARE: STRATEGIES AND STANDARDS

Gyamfi *et al*. believe labour and delivery in the JW patient should take place in a third degree reference medical centre. To maximize safety of a blood-refusing patient, they recommend including in planning of the procedures anaesthetists experienced in the management of obstetrical complications [5].

Husarova and other authors accentuate the usefulness of multidisciplinary standards of management in JW patients in pregnancy, labour and puerperium, developed across the fields of gynaecology and obstetrics, haematology, anaesthesiology and, if necessary, interventional radiology [1, 3, 5].

Belaouchi *et al*. present their own algorithm of managing patients with objections to blood transfusions, as well as very useful, concisely written guidelines regarding legal and ethical aspects as per patient's age, urgency, and the condition of pregnancy [28]. Trivino recommends the use of such algorithms [19]. In their paper, Kidson-Gerber *et al*. propose a simplified scheme of management during pregnancy, labour and puerperium in blood-declining women [3] (Table 3).

Belaouchi *et al*. insist that such regulations should be created with the involvement of representatives of the hospital quality control and legal departments. They also recommend patients to declare to local authorities an official written objection to treatment using blood [28].

Takashima *et al*. present special guidelines for dealing with life-threatening situations requiring blood transfusion, dedicated to Brazilian anaesthetists. The recommendation is to inform the patient and their relatives that, with due respect for the

TABLE 3. Algorithm for managing pregnant women for whom transfusion is not an option. Adapted from [3]

Identify patients	• Ask all patients • Document
Early pregnancy visit with senior clinician (usually consultant obstetrician)	• Discuss and document which blood products are acceptable • Decide on model of care • Decide on planned location of delivery • Develop and implement a plan for optimising haemoglobin through pregnancy • Ask patient to write detailed legally binding advanced care directive, where needed
Mid pregnancy visit with senior clinician	• Review blood results and need for additional therapy • Review advanced care directive and discuss with patient • Organise anaesthetic review • Organise haematology review
Late pregnancy visit with senior clinician	• Review risk factors for post-partum haemorrhage • Re-consider location of birth • In very high risk cases consider review by gynaecology oncology or interventional radiology • Document clear intrapartum and postpartum care plan
Management in labour	• Alert clinicians, intravenous access • Active management of 3rd stage of labour, monitor closely for blood loss
Management of active haemorrhage	• Involve consultants • Early definitive management • Communication between team members, record losses
Management of postpartum anaemia	• Optimise haematinic status and oxygenation, minimise venesection • Consider intravenous iron + ESA

objections, in accordance to law, such objections would not be honoured; in case of physical resistance, the algorithm instructs the medical team to call for assistance of the police [34].

Gyamfi and other authors advise very carefully evaluating the risk of peripartum haemorrhage in the 3rd trimester of pregnancy, and discussing the results with the patient [3, 5]. Kidson-Gerber *et al*. present their own algorithm for risk estimation of postpartum excessive blood loss [3]. The ACOG published an analogous questionnaire, where risk factors were divided into those diagnosed in pregnancy, in the antenatal period, at admission to the delivery room and during labour and delivery [35].

PRENATAL CARE: RISK REDUCTION

The reduction of modifiable risk factors is crucial in the JW group of pregnant women. Anaemia in pregnancy should be prevented, and in case of its development, patients should be directly treated with adequate supplementation of iron, vitamin B_{12} and folic acid in order to enable proper erythropoiesis. It is also important to assess coagulation system sufficiency, as a low fibrinogen level is a strong risk factor in postdelivery haemorrhage [1–6, 18, 28].

Hubbard, Gohel and other authors find prelabour consultation an opportunity for checking the patient's general condition and discovering and thus reducing risk factors, not only in anaemia treatment, but also in management of coagulation dysfunctions or discontinuation of medicines that impair blood clotting [2, 3, 11]. According to Gohel and Ringnes, basic rules of preparation for no-blood surgery include a conservative treatment that intensifies erythropoiesis and increases haemoglobin concentration [11,12]. Scharman *et al*. believe that patient preparation for a possibility of excessive blood loss, i.e. treatment of anaemia, is crucial in such situations [18]. Gyamfi *et al*. recommend provision of dietary guidance, especially in patients on an elimination diet, such as vegetarians or vegans [5]. Rollins and Zeybek warn that conservative treatment of anaemia, even erythropoietin administration and parenteral iron supplementation, is a time-consuming process, with results feasible only in a long time [3, 4, 8].

PERIPARTUM/PERIOPERATIVE MANAGEMENT

The objective of peripartum proceedings in blood-declining patients is to reduce the risk of excessive blood loss, to early diagnose excessive bleeding and to treat it efficiently [1, 10, 29].

The choice of adequate method of caesarean section anaesthesia remains a matter of great importance [5]. Rollins and other authors recommend performing surgery using electric tools to facilitate haemostasis via tissues coagulation, and haemostatic materials such as fibrin tissue adhesives or gelatine sealants [3, 8, 11]. Belaouchi *et al*. propose giving 20 IU of oxytocin IV, of which 5 IU are in a bolus form, and 15 IU administered as a solution in 100 mL of saline in a drip infusion, as intracesarean uterine atony prevention, while our own experience makes us tend to use carbetocin and prostaglandins as more effective uterotonics [28]. Zeybek *et al*. strongly suggest that procedures alternative to blood transfusion should begin before the haemoglobin level decreases to 5–6 g dL^{-1} [4]. Large intravenous cannulae during labour, to facilitate quick crystalloids or colloids infusion, can be used if necessary. Preclusion of the patient's hypothermia that may intensify coagulopathy is also required [3].

Normal pregnancy is characterized by physiological hyperfibrinogenaemia. Low fibrinogen level in the prelabour period is an important risk factor for the development of excessive postpartum blood loss. In some circumstances, e.g. placental abruption, consumption coagulopathy develops, leading to rapid and severe hypofibrinogenaemia and thrombocytopenia. Because plasma fibrinogen concentration in obstetric haemorrhage closely correlates with the risk of secondary bleeding and subsequent coagulopathy, it is necessary to compensate the loss of fibrinogen as soon as possible, yet preventive fibrinogen administration in cases of postdelivery haemorrhage seems not effective [36, 37].

TRANEXAMIC ACID IN PERIPARTUM/ PERIOPERATIVE MANAGEMENT

Zeybek and other authors postulate the use of antifibrinolytic treatment, i.e. tranexamic acid, to diminish blood loss in women in vaginal or caesarean labour, as well as in those in the postdelivery period. They also suggest that eta-aminocaproic acid, desmopressin, recombined active VII coagulation factor and, accepted by some JW patients, concentrates of clotting factors can effectively decrease peripartum blood loss [3, 4, 10]. The ACOG recommends prophylactic predelivery intravenous (IV) administration of 1.0 g of tranexamic acid in patients at high risk of haemorrhage refusing blood treatment [29].

Joint UK Blood Transfusion and Tissue Transplantation Services Professional Advisory Committee (JPAC) experts state that there is evidence that tranexamic acid significantly reduces mortality in obstetric haemorrhage, which is explored in an international randomised trial [38].

Kidson-Gerber *et al*. note that the use of tranexamic acid up to 3 hours from the onset of haemorrhage efficiently reduces bleeding and decreases the risk of thrombotic complications [3]. Cole *et al*. report an effective application of concentrate of prothrombin

complex factors, accepted by some JW patients, as excessive bleeding treatment [10].

In 2017 The World Health Organization declared a new standard of the administration of tranexamic acid specifically in obstetric haemorrhage. Experts recommend early use of intravenous tranexamic acid within 3 hours of birth in addition to standard care for women with clinically diagnosed postpartum haemorrhage following vaginal birth or caesarean section. The benefit appears to decrease by 10% for every 15-minute delay, with no benefit seen after 3 hours. Tranexamic acid should be administered at a fixed dose of 1 g in 10 mL IV at 1 mL per minute. A second dose of 1 g IV should be used if bleeding continues after 30 minutes or if bleeding restarts within 24 hours of completing the first dose. Tranexamic acid should be used in all cases of postpartum haemorrhage, regardless of whether the bleeding is due to genital tract trauma or other causes [39].

Russo *et al*. stress that the use of erythropoietin, tranexamic acid or cryoprecipitate as prophylaxis is not irrelevant, being a risk factor for arterial thrombosis [3].

INTRAOPERATIVE CELL SALVAGE IN PERIPARTUM/ PERIOPERATIVE MANAGEMENT

Belaouchi and Zeybek show the benefits of intraoperative blood salvage with subsequent autologous blood transfusion as a special method of autotransfusion approved by some JW patients [4, 28]. In order to avoid transfusion of amniotic fluid elements, the use of special filters is required in this procedure [28]. Gyamfi *et al*. observe that, despite minor difficulties, amniotic fluid embolism was never reported in case of intraoperative blood salvage during caesarean section [5]. Rollins *et al*. postulate that intraoperative blood salvage and normovolaemic haemodilution should be made standard in JW patients' treatment. At the same time, they accentuate the necessity of informing patients of minimal but still existing risk of reinfusion of neoplastic cells. The authors admit that this procedure may not be acceptable to every JW patient [8].

It is important to explain to the patient that intraoperative blood salvage does not allow re-transfusion of all extravasated blood. During the procedure about 50% of blood volume is lost, while about 40–50% of the volume left is made of red blood cells [41].

In obstetric haemorrhage cell salvage blood can be contaminated with amniotic fluid and fetal blood. The real potential of causing iatrogenic amniotic fluid embolus by peripartum cell-salvage procedures remains unclear. The literature suggests that if tissue factor is effectively removed from salvaged blood, the other components of amniotic fluid would also be removed or their concentration would be significantly reduced [42]. Smith *et al*. deal with, as they write, historical fears that intraoperative cell salvage would increase the risk of amniotic fluid embolus (AFE), infection or coagulopathy. They emphasize there have been no reported cases of AFE attributed to ICS use in obstetrics [43].

Alloimmunisation against Rh-D factor as a consequence of maternal exposure to fetal blood cells, which is common element of every delivery, is easily preventable. Fetal cell burden should be quantified with a Kleihauer-Betke test to determine the maternal dose of anti-D immunoglobulin to be administered within 72 hours of delivery [42, 43].

Hubbard *et al*. report management in a JW patient suffering from severe anaemia and haemodynamic instability that arose as a result of bleeding caused by hysterectomy, performed due to uterine atony during caesarean section. Apart from an infusion of crystalloids and colloids, administration of norepinephrine and vasopressin, haemostatic mesh and aerosol application during surgery and, finally, pelvic cavity packing, Hubbard *et al*. used intraoperative blood salvage with subsequent autotransfusion. Reinfusion of 550 mL salvaged from 3000 mL of extravasated patient's blood increased her haemoglobin level from 1.5 g dL^{-1} at the beginning of laparotomy to 3.5 g dL^{-1} at the end of surgery. Because of the patient's refusal of platelet concentrate and fresh frozen plasma transfusion, haemostasis was stabilized, inter alia using tranexamic acid and recombined active VII coagulation factor [2].

Belaouchi *et al.* report another case using intraoperative blood salvage, crystalloid and colloid infusion, oxygen therapy, wide spectrum uterotonics and clotting factor supplementation, treatments which did not ultimately prevent the need for hysterectomy because of uncontrolled uterine bleeding. After having surgery, the patient spent 29 days at the intensive care unit (ICU). The nadir of her haemoglobin concentration was 2.3 g dL^{-1}. Despite that, Belaouchi *et al*. maintain a positive assessment of guidelines developed in their centre. They attribute this partial failure to prenatal care being conducted by outside practitioners, and the urgent mode of delivery procedures [28].

BLOOD LOSS REDUCTION IN PERIPARTUM/ PERIOPERATIVE MANAGEMENT

Russo *et al*. describe a caesarean delivery with subsequent hysterectomy in the 26th week of gestation, complicated by placenta praevia and trophoblastic invasion of the urinary bladder through uterine scarring developed due to two previous caesarean sections. Aside from preoperative optimization of blood counts and coagulation parameters, Russo *et al*. used the ligation of internal iliac arteries

and, eventually, an intraoperative balloon occlusion of the descending aorta (first in the thoracic region, then below the renal arteries) in conjunction with intraoperative blood salvage. All these procedures allowed reduction of blood loss during caesarean section, subsequent hysterectomy and reconstruction of the partially resected urine bladder. The patient spent her first postoperative day at the ICU. She left hospital in good condition on the eighth day after surgery [6].

To reduce perioperative blood loss, Zeybek *et al.* recommend usage of special surgical procedures, i.e. robotic surgery and blood vessel embolization under radiologic control [4].

Gyamfi *et al*. propose preoperative normovolaemic haemodilution to lower blood viscosity and change the oxygen dissociation curve from haemoglobin to the right, which would improve peripheral tissue oxygenation [5].

In accordance with ACOG recommendations, Kidson-Gerber and other researchers emphasize the vitality of a prompt response in case of excessive bleeding. They recommend radicalization of management, with an indication for hysterectomy to be conducted at a much earlier stage than usual [3, 5, 29].

The opinions cited above indicate that effective therapeutic management in the JW group of patients not only stems from the necessity of development of procedures alternative to existing standards, but also requires the use of special equipment. However, the issue of costs generated by such extra procedures and equipment does not seem to be addressed in the literature at all.

USE OF SYNTHETIC OXYGEN CARRIERS IN SEVERE ANAEMIA

The use of oxygen carriers as an alternative to erythrocytic haemoglobin is still controversial. Posluszny *et al*. report the application of a synthetic oxygen carrier based on bovine haemoglobin (HBOC) to a non-pregnant patient with severe anaemia caused by multi-organ injury. Although the effects of such treatment are insufficient compared to those achieved with red blood transfusion and HBOC usage may constitute a significant risk factor for myocardial infarction due to FDA-unapproved application, Posluszny *et al*. maintain this option to be worth considering in patients refusing blood transfusion in life-threatening situations [40]. Mackenzie *et al*. report successful use of Hemopur, an acellular oxygen carrier based on animal haemoglobin, in a JW patient with multi-organ injuries. It is argued that Hemopur improves the microcirculation and oxygen distribution in the system and, at the same time, helps increase iron, erythropoietin and ferritin concentrations [44]. Zeybek and Alayashi also consider the use of blood substitutes based on haemoglobin polymers acceptable, mentioning such advantages as room temperature storage possibility and no necessity of cross-matching tests. On the other hand, they strongly point towards potentially life-threatening complications, i.e. myocardial infarction, stroke, rapid blood pressure increase, acute renal failure, hepatic enzymes elevation or methemoglobinaemia, amongst other [4, 45–47].

Rollins, Scharman and other researchers emphasize that blood substitutes are not approved for standard use, nor readily available on the pharmaceutical market, and that the benefits of their use are described only in a small number of case reports [3, 8, 12, 18]. The FDA suspension of research concerning this group of pharmaceuticals is a result of the unfavourable side effect profile of HBOC, especially morbidity and mortality rates and toxicity of acellular haemoglobin, compared with the benefits [3, 45–47].

POSTDELIVERY/POSTOPERATIVE MANAGEMENT

In JW patients, postdelivery reduction of blood loss with early diagnosis and treatment of haemorrhage is crucial [8].

Husarova *et al*. note that decisions to refuse blood transfusion, often made when well, can radically change in health- and life-threatening circumstance of obstetric haemorrhage [1]. In cases of severe blood loss it is thus suggested to reconfirm the patient's position on acceptance of blood products.

Rollins *et al*. state that a decrease of haemoglobin concentration to less than 7 g dL^{-1} in the postoperative period increases the risk of the patient's death [1]. Zeybek *et al*. indicate a haemoglobin level ≥ 10 g dL^{-1} as optimal for peripheral tissue oxygenation, and 4 g dL^{-1} as critically low in patients without any comorbidities. Impairment of neurological functions, including cognitive functions, as a result of acute normovolaemic anaemia, occurs at a haemoglobin level 5–6 g dL^{-1} [4]. Posluszny *et al*., citing Carson, demonstrate an increase of death odds ratio in patients with haemoglobin concentration less than 8 g dL^{-1} as 2.5 for every subsequent 1 g dL^{-1} of haemoglobin lost. They also describe the long-term impact of severe anaemia on cognitive functions as unpredictable [40].

Kidson-Gerber *et al*. draw attention to the importance of attentive postdelivery care, with frequent evaluation of the patient's general condition and uterine fundus. They emphasize the need for systematic postdelivery blood loss control, which aids in recognizing persistent loss of small blood volumes, eventually resulting in significant deficiency [3].

Rollins *et al*. suggest reducing postoperative blood loss through use of small intravenous cannulae, avoidance of unnecessary intravenous lines,

and wound drainage to reinfuse drained content [8]. Such procedures seem at least controversial and not exactly effective, for which reason they are not sanctioned in our department.

In case of postdelivery haemorrhage, the patient should be transferred to the operating room immediately. It is necessary to summon all required staff and not delay the surgical intervention [3, 11, 29]. Our experience shows the importance of adequate timing of indications for hysterectomy. The aim is to avoid unnecessary uterine excision in women at reproductive age; however, from another point of view, the delay in the beginning of the operation may lead to severe coagulopathy with continuing blood loss and difficult surgery conditions.

If intrapartum blood loss occurs, it is essential to reduce its effects [48]. Aside from pharmacological erythropoiesis stimulation, Gohel *et al*. advise efficient anti-infectious prevention, as infection, enhancing catabolism, can increase oxygen consumption. They also postulate maintenance of circulatory and respiratory functions not only by oxygen therapy but also breathing exercise. Adequate treatment of hypertension and postoperative pain is also accentuated [11].

Kidson-Gerber *et al*. propose intravenous iron administration in women suffering from severe posthaemorrhagic anaemia, which, in comparison with oral administration, shortens the time frame needed for the increase of haemoglobin level [3]. Zeybek *et al*. warn that IV iron can trigger an anaphylactic reaction [4].

Intravenous iron preparations contain bound ferric iron. Third-generation IV iron preparations, with ferric iron carboxymaltose and ferric iron isomaltoside, have improved the quality of treatment by reducing serious adverse reactions and simplifying the mode of administration. Milman emphasizes that intravenous iron produces a faster and higher increase in the haemoglobin concentration than oral iron. Furthermore, IV iron administered as total dose infusion yields replenishment of iron reserves within a few days compared with long lasting oral iron therapy. The author reports the frequency of adverse events below 0.5%, yet he warns that the infusion of iron should be given in a setting where equipment for cardiopulmonary resuscitation is available. The dose of IV iron should be adequate to obtain a haemoglobin level of at least 12 g dL^{-1}, then the patient may change her treatment to oral [49].

Holm found statistically significant improvement in patient outcomes when comparing IV single high-dose infusion of iron isomaltoside to oral iron treatment after postpartum haemorrhage. Fast haematopoietic response and a prompt replenishment of iron stores after treatment with IV iron were confirmed. The difference between IV iron and oral iron persisted for 12 weeks [50].

As a result of their systematic review, Sultan *et al*. found that in women who suffered from postdelivery anaemia haemoglobin concentration at 6 weeks postpartum was almost 1 g dL^{-1} higher after intravenous iron administration compared to those treated with oral iron supplementation. The safety profile of intravenous iron was also favourable. Taking into account the weaker haemoglobin response and higher risk of gastrointestinal side effects in oral iron use, the authors suggest that intravenous iron should be considered as a viable treatment option for postpartum iron deficiency anaemia [51].

Application of erythropoietin not only enhances hematopoietic function of bone marrow, but also plays an antiapoptotic role, minimizing tissue ischemia and hypoxemia. Simultaneous supplementation of erythropoiesis substrates such as iron, folic acid and vitamin B_{12} is necessary. It is emphasised that oral iron administration combined with parenteral application of erythropoietin is not adequate for patients who have experienced severe blood loss [4]. Posluszny and Zeybek warn of thrombotic complications in patients treated with high doses of erythropoietin [4, 40].

Mackenzie *et al*. state that in a post-traumatic state, the postoperative period included, haematopoiesis can be reduced through high levels of cytokines that inhibit erythropoietin gene expression, iron metabolism and haematopoiesis itself. This can decrease erythropoietin effectiveness to much lower than expected. In such circumstances, to inhibit the inflammatory response and potentiate erythropoietin action, Mackenzie *et al*. recommend intravenous infusion of hypertonic (7.5%) sodium chloride [44].

Though hyperbaric oxygen therapy in severe isovolaemic anaemia remains controversial, the treatment can present an opportunity for adequate peripheral tissue oxygenation and inhibition of cytokine activity alike [3].

Habler recommends hyperoxic ventilation as a procedure to increase the dissolved fraction of arterial plasma oxygen. High biologic availability of this oxygen fraction improves natural tolerance of the patient's organism to anaemia. For this purpose the author also advises the patient's muscular relaxation to decrease peripheral oxygen consumption, and hypothermia, which is usable only in non-bleeding individuals for its potential to impair coagulation [52].

Gyamfi *et al*. suggest the patient's perioperative sedation as a reductive method of oxygen consumption in peripheral tissues; in severely hypoxic

patients Hubbard *et al*. recommend induced coma for prevention of neurological damage [2, 5].

CONCLUSIONS

As demonstrated above, all authors agree that obtaining clear information about the patient's blood refusal is crucial for the patient's safety in the perinatal period. Given time, such information allows medical staff to develop a strategy to reduce risk in case of obstetric haemorrhage. It is valuable during patient preparation for elective procedures but, unfortunately, of little, if no use entirely, in urgent situations.

Our own experience shows that most JW patients inform staff spontaneously about their refusal of blood treatment, usually at the admission to the hospital or on their first ambulatory visit. Having said that, we came across a patient who concealed her objections to blood transfusion, deciding to inform staff as late as during life-threatening haemorrhage.

To minimise the risk of not collecting information about blood refusal, a question about consent or refusal of blood treatment should be included in a standard interview undertaken both in ambulatory prenatal care and in a hospital admission room. It may be appropriate to enquire if there is any specific kind of treatment unacceptable to the patient. The answer should be documented, certified by the patient's signature and included in the history.

It is suggested to put a discrete note in the pregnancy card, since admission to the hospital can distract the patient and cause them to omit such information in the admission interview. It would also be advisable to interview the patient more specifically regarding the aspect of potential blood refusal. Most JW patients in Poland submit a "No blood!" document, letting the hospital staff know they refuse any blood treatment, while in reality their objections can actually differ; for example the majority of puerperal women qualified for anti-Rh immunoglobulin administration as a means of anti-Rh immunization prevention agree to this procedure.

The next step would thus be to design a questionnaire dedicated solely to JW patients, to specify which blood products are acceptable for a particular patient. It is necessary to inform patients about the compromised effectiveness of "alternative" treatment methods to blood transfusion, as well as resulting risks, including loss of health or life. Patients should confirm having received such information with their signature.

A detailed algorithm of management in the case of a blood-refusing pregnant patient, including ambulatory care, perinatal and puerperal hospital care, would be helpful for medical staff, thus reducing dilemmas about procedure adequacy and eliminating ineffective activities, which in turn could shorten the time between diagnosis and successful treatment. Such a document should be developed in cooperation between obstetricians, anaesthesiologists and a representative of the legal department of the hospital.

Blood salvage equipment, not being standard for obstetric departments, may not be available in every hospital. What is more, the additional cost generated by such equipment is rarely mentioned in the literature.

The use of blood substitutes based on allogenic haemoglobin is not permitted in Poland and cannot be included in the proposed management.

ACKNOWLEDGEMENTS

1. Financial support and sponsorship: none.
2. Conflict of interest: none.

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