

ORIGINAL PAPERS

Adv Clin Exp Med 2007, 16, 6, 769–775
ISSN 1230-025X

© Copyright by Silesian Piasts
University of Medicine in Wrocław

ALEKSANDRA IZNEROWICZ, JOWITA MOTOWIDŁO, DARIUSZ PATRZAŁEK

Organ Wastage During the Transplant Coordination Process – Retrospective Analysis

Marnowanie narządów w toku procedur transplantologicznych – analiza retrospektywna

Department of Vascular, General and Transplantation Surgery, Silesian Piasts University of Medicine in Wrocław, Poland

Abstract

Background. Transplantation has been a recognized method of treating terminal organ malfunction for many years. Despite of its high efficacy, the number of patients receiving transplanted organs is still insufficient. Consequently, current referrals of potential donors should be exploited more effectively.

Objectives. Analyzing the process of potential donor identification and the possibilities of organ retrieval (from referring the potential donor to transplanting the graft) based on data from the regions of Opole and Lower Silesia and suggesting some methods to minimize the wastage of organs retrieved from cadaveric donors.

Material and Methods. All patients referred to the Poltransplant center for the regions of Lower Silesia and Opole in 2006 were retrospectively analyzed for the loss of organs suitable for donation based on coordination protocols. The potential organ donors were patients diagnosed as brain-stem dead according to the criteria of the decree of the Polish Ministry of Health of October 29, 1996.

Results. From January 1 to December 31, 2006, 77 potential donors were referred to the Poltransplant center in Wrocław. There were 59 organ retrievals. The percentage of multi-organ retrievals was 39%. The efficacy coefficient (the number of transplanted organs/number of actual donors) was 2.5. Considering only organs meeting the classical criteria, the percentage of multi-organ procurements could increase to 64.4%. Considering also organs meeting the extended donor criteria, the percentage of multi-organ procurements could grow to 76.3%. The respective efficacy coefficients could thus amount to appropriately 3.59 and 4.06 organs per donor.

Conclusions. Analyzing the successive stages of the transplant coordination process, the number of organs possible to retrieve was shown in this study. Those organs may be retrospectively regarded as wasted (*Adv Clin Exp Med* 2007, 16, 6, 769–775).

Key words: organs wastage, transplant coordination, classical criteria, extended criteria.

Streszczenie

Wprowadzenie. Transplantacja, mimo dużej skuteczności leczenia skrajnej niewydolności narządów, nie zaspokaja potrzeb pacjentów oczekujących na przeszczep. W związku z niewystarczającą liczbą zgłoszeń należy istniejące zgłoszenia skuteczniej wykorzystywać.

Cel pracy. Analiza na przykładzie województw dolnośląskiego i opolskiego procesu identyfikacji potencjalnych dawców i możliwości pozyskiwania narządów od chwili zgłoszenia do realizacji przeszczepu oraz zaproponowanie metod zmniejszenia strat narządów pobranych od zmarłych dawców.

Materiał i metody. Retrospektywna analiza wszystkich przypadków potencjalnych dawców zgłoszonych do dolnośląskiego biura Poltransplantu od 1.01 do 31.12.2006 r. na podstawie zgromadzonych tam kart koordynacyjnych i protokołów operacyjnych. Potencjalnymi dawcami są pacjenci ze zdiagnozowaną śmiercią pnia mózgu zgodnie z kryteriami przedstawionymi w rozporządzeniu Ministerstwa Zdrowia z 29 października 1996 r.

Wyniki. W okresie 1.01–31.12.2006 r. do dolnośląskiego ośrodka Poltransplantu zgłoszono 77 potencjalnych dawców narządów. Odbyło się 59 pobrań narządów, spośród których 38,98% były pobraniami wielonarządowymi. Współczynnik przeszczepionych narządów do liczby dawców wyniósł 2,5. Po zakwalifikowaniu dodatkowych narządów nieuwzględnionych w procedurze transplantacyjnej, a spełniających kryteria klasyczne zgodne z kryteria-

mi Poltransplantu odsetek pobrań wielonarządowych wyniósłby 64,4%, a ww. współczynnik – 3,59. W przypadku kryteriów rozszerzonych odsetek pobrań wielonarządowych wyniósłby 76,27%, a ww. współczynnik – 4,06.

Wnioski. Analizując kolejne etapy procesu koordynacji pod kątem strat narządów od już zaakceptowanych dawców, udowodniono utratę organów spełniających kryteria standardowe oraz rozszerzone (*Adv Clin Exp Med* 2007, 16, 6, 769–775).

Słowa kluczowe: marnowanie narządów, koordynacja, kryteria standardowe, kryteria rozszerzone.

Transplantation has been a recognized method of treating terminal organ malfunction for many years. Despite its high efficacy, the number of patients receiving transplanted organs is still insufficient. Current referrals of potential donors should be used more effectively to improve this situation. The transplant waiting lists inform us of the demand for transplants in Poland. According to these, 2301 patients were waiting for kidneys (including 9 also waiting for a pancreas), 417 for a liver, 357 for a heart, 22 for heart and lung, and 27 for lung alone in 2006. Twenty-eight of these patients died while waiting. The aim of this study was 1) to analyze the process of potential donor identification and the possibilities of organ retrieval (from referring the potential donor to transplanting the graft) based on data from the regions of Opole and Lower Silesia and 2) to suggest some methods to minimize the wastage of organs retrieved from cadaveric donors.

Material and Methods

All patients referred to the Poltransplant center for Lower Silesia and Opole in 2006 were retrospectively analyzed for the loss of organs suitable for donation based on the coordination forms (Figs. 1 and 2). Potential organ donors were patients diagnosed as brain-stem dead according to the criteria of the decree of the Polish Ministry of Health of October 29, 1996. Based on the medical parameters documented in the coordination protocols, organs were assessed as suitable for donation according to the classical and extended criteria consistent with Poltransplant criteria for each organ (Table 1) [1]. The extended criteria for the liver and heart are presented in the references [2, 3].

Exclusion criteria for organ donation are active tuberculosis, human immunodeficiency virus (HIV) infection or positive serological or viral culture findings, Creutzfeldt-Jakob disease, and unresolved septicemia. Active viral hepatitis is an exclusion criterion for organ donation except for anti-HBc IgG-positive heart and kidney donors whose organs are to be used for a patient who is a carrier of the same hepatotropic virus. In HBV carriers, HBe antigen measurement (a sign of greater infectiousness of HBV) is indicated. In

patients with positive HCV antibodies, HCV RNA assay (a sign of active infection) is indicated. According to the majority of transplantologists, CMV antibodies as a sign of a latent infection are no contraindication for organ donation. Further exclusion criteria are malignant tumors except primary brain tumor, basalioma, and cervical carcinoma in situ; generalized arteriosclerosis; and connective tissue disease, collagenosis, vasculitis, amyloidosis, and sclerodermia.

Relative contraindications for organ donation include age > 70, hypertension, diabetes mellitus, a long history of using pharmaceutical agents toxic to particular organs, a history of alcoholism (contraindication for liver, pancreas, heart, and, rarely, kidney donation), and donors at high risk of HIV infection (homo- and heterosexual prostitutes, drug addicts). It is indicated to measure HIV antigen additionally. Further relative contraindications are agranulocytosis, aplastic anemia, and hemophilia.

Results

From January 1 to December 31, 2006, 77 potential donors were referred to the Poltransplant center in Wrocław. These referrals came from the regions of Lower Silesia (2,985,000 inhabitants) and Opole (1,091,000 inhabitants) and were referred by 16 hospitals, although the number of medical centers capable of caring for potential donor in this area is 42 (which means that 38% of the medical centers were active). In 11 cases the family refused to consent to organ donation (14.3% of all referrals, in all of Poland: 10.04%). These refusals were respected and further procedures were waived. In another 7 cases the potential donors failed to become actual donors for medical reasons (hemodynamic collapse or cardiopulmonary arrest). In another 59 cases coordinated by this center, 117 kidneys, 17 livers, 15 hearts, 2 pancreases, 2 pairs of lungs, and 3 pairs of corneas were procured and subsequently transplanted. This comprised approximately 99, 28.8, 25.4, 3.4%, 3.7, and 5.1% of all the respective organ procurements (Fig. 3). Of the total number of recovered organs, seven kidneys were not transplanted. It should be pointed that in four cases a recipient was not found. The other three

| POLSKA POLITYKA TRANSPLANTACyjNA | | | | | | | | | | KARTA KOORDYNACYJNA POBRANIA NARZĄDÓW | | | | | | | | | |
|----------------------------------|--|---------------------|--|---------------------------|--|------------------|--|----------------------------|--|---------------------------------------|--|------------|--|--|--|--|--|--|--|
| ZGŁOSZENIE NR | | | | AB0 | | Rh | | DAWCA : | | | | pleć K / M | | | | | | | |
| OSRODEK ZGLASZAJĄCY : | | | | | | | | data urodzenia: | | | | PESEL: | | | | | | | |
| | | | | | | | | adres zam.: | | | | | | | | | | | |
| adres: | | | | | | | | ☎ numer telefonu/fax | | | | | | | | | | | |
| Nazwisko zgłaszającego : | | | | | | | | ☎ numer telefonu/fax | | | | | | | | | | | |
| Data zgłoszenia : | | | | godzina: | | koordynator: | | ☎ numer telefonu | | | | | | | | | | | |
| DANE OGÓLNE | | | | BADANIA SEROLOGICZNE | | | | PODAWANE LEKI | | | | | | | | | | | |
| przyczyna zgonu: | | | | HIVab | | CMV/IgG | | wazopresyjne : | | | | | | | | | | | |
| choroby dodatkowe : | | | | HBsAg | | CMV/IgM | | | | | | | | | | | | | |
| | | | | HCVab | | Kiła-VDRL | | | | | | | | | | | | | |
| | | | | HBcore | | toxoplazma | | moczopędne : | | | | | | | | | | | |
| przyjęty dnia : | | | | godzina : | | uwagi : | | koloidy: | | | | | | | | | | | |
| respirator : | | | | | | | | przetoczenia ME / FFP : | | | | | | | | | | | |
| CRS : | | | | Rodzina: | | | | antybiotyki : | | | | | | | | | | | |
| temperatura : | | | | | | | | | | | | | | | | | | | |
| cewnik : | | | | BADANIA DODATKOWE - NERKI | | | | antydiuretyki : | | | | | | | | | | | |
| Data zgonu: | | | | godzina | | data/godz. | | | | | | inne : | | | | | | | |
| UKŁAD KRAŻENIA | | | | Mocznik (mg%) | | | | | | | | | | | | | | | |
| diureza/dobę : | | ml | | ml/godz. | | Kreatynina (mg%) | | | | | | uwagi : | | | | | | | |
| data | | data | | | | osad | | erytrocyty | | nabłonki | | | | | | | | | |
| RR: | | mmHg | | mmHg | | | | leukocyty | | bakterie | | | | | | | | | |
| czynność serca: | | b/min | | b/min | | glukoza | | białko | | | | | | | | | | | |
| OCZ : | | cm/H ₂ O | | cm/H ₂ O | | posiew moczu: | | | | | | | | | | | | | |
| | | mmHg | | data | | czas | | Uwagi: | | | | | | | | | | | |
| Hipotensja : | | T / N | | | | | | | | | | | | | | | | | |
| NZK : | | T / N | | | | | | | | | | | | | | | | | |
| Resuscytacja : | | T / N | | | | | | diureza : podczas / po NZK | | ml/godz. | | | | | | | | | |

Fig. 1. First page of the Polish coordination form

Ryc. 1. Pierwsza strona polskiej karty koordynacyjnej

| WYNIKI BADAŃ LABORATORYJNYCH | | | | BADANIA DIAGNOSTYCZNE: | | | | BADANIA DODATKOWE - SERCE | | | |
|--|--|--------------|--|------------------------|--|-------------------|--|------------------------------|--|--|--|
| data / godzina | | | | Rtg kl. piersiowej: | | | | data/godzina | | | |
| Ht (%) | | | | | | | | CK (U/L) | | | |
| Hb (g%) | | | | | | | | CK-MB (U/L) | | | |
| Leukocyty (tys/ml) | | | | EKG: | | | | Troponina | | | |
| Płytki (tys/ml) | | | | | | | | BADANIA DODATKOWE - TRZUSTKA | | | |
| Na ⁺ (mmol/L) | | | | ECHO Serca: | | | | Glukoza (mg%) | | | |
| K ⁺ (mmol/L) | | | | | | | | Amylaza-sur (U/L) | | | |
| P (mg%) | | | | | | | | Amyl-mocz (U/L) | | | |
| Mg ²⁺ (mg%) | | | | USG j. brzusznej: | | | | Lipaza (U/L) | | | |
| Ca ²⁺ (mmol/L) | | | | | | | | BADANIA DODATKOWE - WĄTROBA | | | |
| pCO ₂ (mmHg) | | | | | | | | Bilirubina (mg/dl) | | | |
| pO ₂ (mmHg) | | | | | | | | Bilirubina bezp. | | | |
| pH | | | | | | | | AspAT (U/L) | | | |
| BE (mmol/L) | | | | waga (kg) | | wzrost (cm) | | AlAT (U/L) | | | |
| HCO ₃ ⁻ (mmol/L) | | | | Obw. kl.piers.(cm) | | Obw. brzucha (cm) | | LDH (U/L) | | | |
| sat O ₂ (%) | | | | uwagi : | | | | GGTP (U/L) | | | |
| Fi O ₂ (L) | | | | | | | | ALP (Fosf. zas.) | | | |
| Data pobrania: | | | | godzina: | | | | APTT (cz.k-k)(sek.) | | | |
| | | POBRANIE | | PRZESZCZEPIENIE | | FUNKCJA BEZPOŚR. | | PTT(cz.protr.) (sek) | | | |
| | | T / N zespół | | T / N | | T / N | | Wsk.Quicka (%) | | | |
| NERKA PRAWA | | | | | | | | INR | | | |
| NERKA LEWA | | | | | | | | Fibrynogen (g/l) | | | |
| SERCE | | | | | | | | AT3 (%) | | | |
| TRZUSTKA | | | | | | | | Białko (g/dl) | | | |
| WĄTROBA | | | | | | | | Albuminy (g/dl) | | | |

Fig. 2. Second page of the Polish coordination form

Ryc. 2. Druga strona polskiej karty koordynacyjnej

Table 1. Classical and extended criteria for organ donation**Tabela 1.** Standardowe i rozszerzone kryteria kwalifikacji narządów

| | Classical Criteria (Kryteria standardowe) | Extended Criteria (Kryteria rozszerzone) | Contraindications for particular organs (Przeciwwskazania do pobrania) poszczególnych organów) |
|----------------------------------|--|---|---|
| Kidney (Nerki) | age: newborn > 7 days of life to 70 years, BUN < 100 mg/l, serum creatinine < 3.5 mg/dl, diuresis > 0.5 ml/kg/h | age > 70 | strict contraindication: chronic kidney disease (raised BUN and serum creatinine level, proteinuria > 1 g/24h), relative contraindication (evaluated individually): history of hypertension or diabetes mellitus |
| Liver (Wątroba) [2, 5, 8] | age 5–50 years, ICU hospitalization < 7 days, systolic RR 80–100 mm Hg, central venous pressure > 5 cm H ₂ O, PaO ₂ 100 mmHg, hypotension (systolic RR < 80 mm Hg) not longer than 20 min, no record of cardiac arrest, dopamine infusion < 10 µg/kg/min, AST, ALT < 100 U/l, total bilirubin < 2 mg/dl, no coagulation disorders | age > 60, Na ⁺ > 155 mmol/l, creatinine > 1.2 mg/100 ml | alcoholism, Na ⁺ > 170 mmol/l, steatosis > 40%, liver trauma |
| Heart (Serce) [3, 8] | age < 50 years, no history of heart disorders, no signs of thoracic trauma, short period of ICU hospitalization, no pathological signs on ECG, dopamine infusion < 10 µg/kg/min, blood group compatibility, no record of cardiac arrest, if after a short incident of cardiac arrest the circulation stabilized, ECG, echo- cardiogram, and enzyme levels (CK, CKMB, troponine) are needed to evaluate the effects of ischemia | age < 55 years, short periods of hypo- tension or cardiac arrest without lasting signs of ischemia, thoracic trauma with no sign of cardiac trauma | elevated troponine, low EF in UKG, alcoholism, cardiac trauma |
| Pancreas (Trzustka) [5, 8] | age 5–50 years, serum amylase level no higher than 300 U/l, hyperglycemia possible to control, no long-lasting hypotension, no history of pancreatitis, no history of alcoholism | no extended criteria | alcoholism, pancreatitis, pancreatic edema |
| Lungs (Płuca) | age < 55 years, no signs of aspiration, bronchofibroscopy, no signs of the infection, no history of tobacco consumption, no signs of trauma or surgery on the lung which is supposed to be transplanted, thoracic X-ray, contralateral signs of contusion or hematoma are not strict contraindications, pO ₂ > 300 mm Hg after 5-min ventilation with 100% O ₂ (PEEP 5 cm H ₂ O) | age > 55 years, tobacco consumption > 1 pack of cigarettes/ /day/20-years, limited thoracic trauma, respirator > 48 h, history of asthma (+), primary brain tumor, positive sputum culture, saturation < 300 mmHg (FiO ₂ = 2), PEEP = 5 cm H ₂ O, limited thoracic X-ray changes, bronchofibroscopy, secre- tion in the main airways | extensive thoracic trauma, tumor (+), extensive thoracic X-ray changes, bronchofibroscopy, purulent secretion in the airways, signs of aspiration pneumonia |

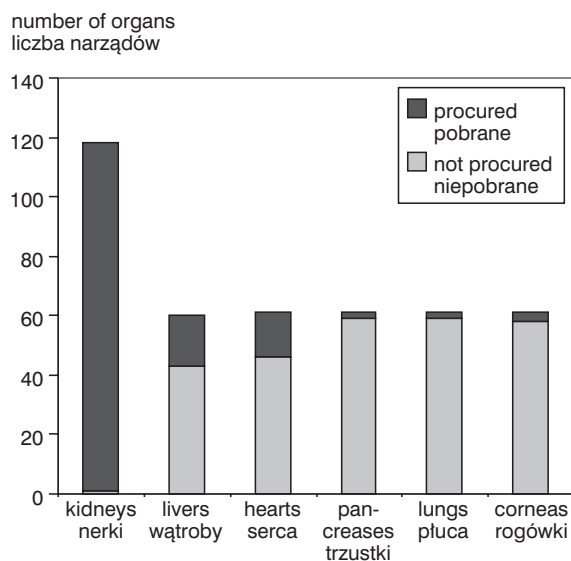


Fig. 3. Comparison of the number of organs procured to those not procured in 59 organ procurements

Ryc. 3. Porównanie liczby narządów pobranych do niepobranych podczas 59 operacji

kidneys were rejected because of positive HCV tests (2) or hypoplastic changes (1). One pancreas was not transplanted for unknown reason.

The efficacy coefficient was 2.5 organs per donor, the same as for all of Poland. The percentage of multi-organ retrievals was 39% (multi-organ retrievals were 45% of all retrievals in Poland in 2006). Using the classical criteria for organ donation consistent with the Poltransplant criteria (described in Material and Methods), 2 livers, 8 hearts, 17 pancreas, 24 pairs of lungs, and 18 pairs of corneas were qualified as adequate for recovery but disregarded in the procedure. This comprised appropriately 3.4, 13.5, 28.8, 40.67, and 30.5%, respectively, of all the 59 organ procurements. Using the extended donor criteria (described above), a further 11 livers, 9 hearts, and 9 pairs of lungs were qualified. This comprised appropriately 18.6, 15.2, and 15.2% of all the respective organ procurements (Fig. 4).

Considering only organs meeting the classical criteria, the percentages of organ procurements would be appropriately 32.2 of livers, 39 of hearts, 32.2 of pancreases, 44 of lungs, and 35.6% of corneas. The percentage of multi-organ procurements could be increased to 64.4%. After also considering organs meeting the extended donor criteria, the percentages of organ procurements could increase to 50.8% of livers, 54.2% of hearts, and 57.6% of lungs. The percentage of multi-organ procurements could be increased to 76.3%. The number of recovered organs in the 59 organ procurements coordinated by this center could be increased (Fig. 5)

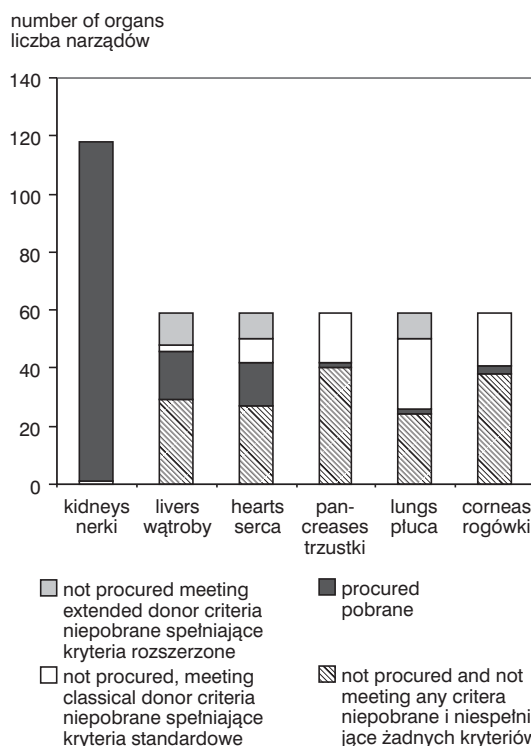


Fig. 4. Comparison of the numbers of organs not procured which met the classical or extended donor criteria to those actually procured and not procured, not meeting any donor criteria

Ryc. 4. Porównanie liczby narządów zakwalifikowanych za pomocą kryteriów standardowych i rozszerzonych, lecz niepobranych oraz rzeczywiście pobranych do liczby niepobranych, niespełniających żadnych kryteriów w łącznej liczbie 59 zabiegów

Discussion

In December 2006, the numbers of patients waiting for transplantation on official Poltransplant lists were: 1167 for a kidney, 159 for a liver, 179 for a heart, 18 for lungs, and 13 for a combined heart and lung transplantation. There was a decline of 150 in the number of transplant surgeries in 2006 compared with 2005. The numbers of kidney and liver transplants decreased most significantly (by 14 and 10%). In 2007, a further sharp decline in the number of transplanted organs is observed. Despite the enormity of the problems concerning transplant surgery nowadays, no references about organ wastage in Polish medical journals were found. This matter has also never been the main concern of any foreign article, being only an additional aspect in some of them. Moreover, there are no available statistics or records describing the efficacy of organ retrieval in particular transplant centers. Considering the issue of organ wastage, the initial stages of coordination, such as recognizing and referring the potential donor, should be men-

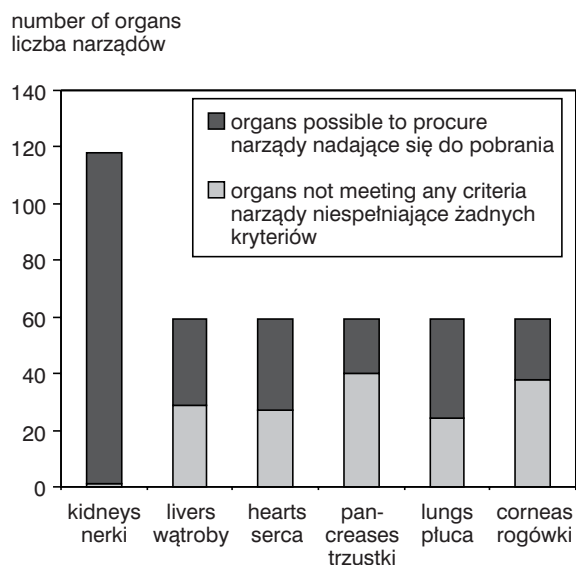


Fig. 5. Hypothetical comparison of organs available for transplantation to organs not meeting any criteria in 59 organ procurements

Ryc. 5. Hipotetyczne porównanie liczby narządów nadających się do pobrania i tych niespełniających wymagań klasycznych i rozszerzonych kryteriów w łącznej liczbie 59 pobrań

tioned. Many factors influencing these stages make their analysis problematic in Poland. Public opinion polls concerning support for transplantation are not widely published. This interferes with preparing an efficient community awareness campaign. The experiences of other countries show that such a program properly prepared helps individuals in deciding about giving permission to donate their organs [2]. Moreover, personnel are very often insufficiently prepared to interact with families, which may result in a significant percentage of family refusals of organ donation [2, 5]. There are cases of disqualifying particular organs because of metabolic disorders which may have been a consequence of poor donor management. Disseminating the donor management protocol [3, 4] which standardizes this procedure would help to find, define, and solve the most common problems.

In the present study, the number of organs possible to retrieve was shown. These organs may be retrospectively regarded as wasted. Using only all the organs meeting the classical criteria would

raise the efficacy coefficient from 2.5 to 3.59. Using also those meeting the extended criteria raises that coefficient to 4.06. The wasting of organs meeting the classical and extended criteria was demonstrated here by analyzing the successive stages of the coordination process.

Based on the above, the following conclusions may be drawn:

- the extended donor criteria for marginal organs are not used frequently enough,
- the current standards of qualifying organs for donation and the extended criteria are insufficiently widespread. Providing supplementary training to personnel participating in the coordination should help to solve this problem,
- the attitude towards diagnosing a patient as brain dead is viewed negatively in some circles of physicians. This may be a consequence of insufficient knowledge in this matter,
- progress in the logistic part of the coordination has been too slow. Insufficient communication between centers leads to excluding particular areas from transplant procedures,
- cooperation among many transplant centers and unscheduled working hours characterize transplant procedures. Because of this, accounts between them should be cleared as they arise. Otherwise a lack of motivation will be observed,
- there is no full-time position for a local transplant coordinator in the region of Lower Silesia. Comparison with centers outside Lower Silesia which have such a position shows its very positive impact on the efficacy of the coordination process [6, 7],
- the percentage of multi-organ retrievals (which was 39% for this center and 45% for all of Poland) could be increased if the logistics part of the process were improved. The time of cold ischemia limits the distance for motor and railway transport. Moreover, the number of centers transplanting not only kidneys is too small,
- the significant number of organs for which no recipients were found is evidence of insufficient cooperation with international coordinating centers.

Solving all of the above problems would help to improve the statistics and increase the chances for patients on waiting lists to receive organs.

References

- [1] Czerwiński J, Malanowski P: Biuletyn informacyjny Poltransplantu 2007, 1428–1825.
- [2] Hetz H, Herkner H, Rasoul-Rockenschaub S, Solimant T: Combination of extended donor criteria and changes in the model for end-stage liver disease score predict patient survival and primary dysfunction in liver transplantation: A retrospective analysis. *Transplantation* 2007, 83, 5, 588–592.
- [3] Kuch J, Adamska-Dyniewska H, Bochenek J: Niewydolność serca – standardy Polskiego Towarzystwa Kardiologicznego 1997.

- [4] **Faltin DL, Jeannet M, Suter PM:** The decrease in organ donation from 1985 to 1990 caused by increasing medical contraindications and refusals by relatives. *Transplantation* 1992, 54, 85–88.
- [5] **Salim A, Velmahos GC, Brown C, Belzberg H, Demetriades D:** Aggressive organ donor management significantly increases the number of organs available for transplantation. *J Trauma* 2005, 58, 991–994.
- [6] **Floden A, Kelvered M, Frid I, Backman L:** Causes why organ donation was not carried out despite the deceased being positive to donation. *Transplant Proc* 2006, 38, 2619–2621.
- [7] **Baer N:** Canada's organ shortage is severe and getting worse. *Can Med Assoc J* 1997, 157, 179–182.
- [8] **Roth BJ, Sher L, Murray JA, Belzberg H, Mateo R, Heeran A, Romero J, Mone T, Chan L, Selby R:** Cadaveric organ donor recruitment at Los Angeles County Hospital: improvement after formation of a structured clinical, educational and administrative service. *Clin Transplant* 2003, 17, Suppl. 9, 52–57.
- [9] **Santiago C, Gomez P, Olivares J, de la Conception M:** Evaluation of organ procurement in area under the influence of training program. *Transplan Proc* 2005, 37, 3649–3650.

Address for correspondence:

Aleksandra Iznerowicz
Traugutta 144/43
50-420 Wrocław
Poland
Tel.: +48 506 829 231
E-mail: olaizn@interia.pl

Conflict of interest: None declared

Received: 25.07.2007

Revised: 5.11.2007

Accepted: 7.12.2007