Attitude and knowledge about Organ Donation among Nurses in Croatia, A Single-center Cross-sectional Study

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Abstract

Background: The aim of this study was to determine whether there are differences in opinion and knowledge about organ donation of nurses working in the surgical and non-surgical department.

Methods: This cross-sectional study included 223 nurses working in surgical, and non-surgical departments. An anonymous survey questionnaire was used as a research instrument, which consisted of questions on socio-demographic data, and questions on opinions and knowledge about organ donation.

Results: Most participants would donate their organs after death (71.2%). The most common reason for not donating organs was insufficient information (40%), the importance of knowing that their body will be whole at the time of burial (21.8%), and the age of the respondents (20%). Participants would donate organs after the death of a close family member (52.3%). 29 (13.2%) participants have a donor card, significantly more of them from surgical departments ($P = 0.04$). Participants who would not donate their organs were significantly more likely to say that they would not or did not know whether they would receive an organ from a person of another religion ($P < 0.001$). Participants from surgical departments ($P = 0.04$) and Masters of Nursing have significantly more correct answers. ($P = 0.009$).

Conclusion: Most participants would donate their organs after death, with no statistical significance regarding the position and level of education. Knowledge about organ donation was average, significantly higher among Masters of Nursing and among participants from surgical departments.

Background

Transplantation is the process of transplanting cells, tissues or organs from one place to another within the same organism (auto transplantation) or from one individual to another (allo-transplantation, xenotransplantation) [1]. Organs and tissues for transplantation can be obtained from deceased individuals and from living related and living unrelated donors. The rapid development of medicine with the help of modern technology has significantly influenced the improvement and prolongation of human life. Organ transplantation today is a worldwide accepted and successful method of treating patients with irreversible organ failure. Scientific advances in the fields of immunology, pharmacology, transfusiology, as well as surgery have enabled the transplantation of human organs and tissues. Surgery is no longer a technique and skill that only removes diseased organs (demoliative surgery) but has become a technique and skill that can replace diseased human organs with their substitutes (substitution surgery). Many patients who a few decades ago could have expected only death or at best a hard and limited life, today can recover by organ replacement and have an almost normal and wholesome life [2].

Despite the great advances in transplant medicine, there is still a significant disparity between organ needs in relation to the number of organ donors. The basic prerequisite for transplantation is the availability of organs, and they are mostly obtained from brain-dead patients. For this reason, proving
Brain death is the first and indispensable step of the entire transplant process. Brain death implies irreversible disruption of the function of the cerebrum, cerebellum and brainstem [3]. Brain death is the irreversible loss of all brain functions. The most clinically accurate definition says that brain death is an irreversible loss of all integral functions of neurons. Today, brain death is also thought to mean human death [4].

In Croatia, transplant medicine is regulated based on legislation of the Ministry of Health, which has resulted in significant success in the number of explanted organs. What has certainly contributed is the legal provision of presumed consent, which considers any deceased person to be an organ donor if they have not explicitly objected to it during their lifetime. [3]. Although our law does not prescribe the obligation to seek permission to explant the organs of a deceased person, in practice the wishes of the family are respected. Minors and young adults who are not legally capable are excluded from the above.

50 years ago, the transplant organization Eurotransplant International Foundation was founded, and Croatia joined as a full member in 2007, along with Austria, Germany, Slovenia, the Netherlands, Luxembourg, Hungary, and Belgium. The international cooperation has enabled timely retrieval, better matching, greater usability, and availability of donated organs to recipients on the waiting list.

The increase in the number of donors and transplants in Croatia have positioned our country at the very top of European transplant medicine [5]. In 2018, a total of 356 organs were transplanted, of which 183 were kidneys, 133 livers, 37 hearts and 3 pancreases. The number of patients on the waiting list in 2018 was 448 patients (6). In 2018, the number of donated and transplanted organs in Croatia increased by 19% and 11%, respectively, compared to 2017. A successful donor program with a record rate of 41 organ donors per million inhabitants is equally successfully monitored by solid organ transplant programs with a total transplant rate higher than 86 per million inhabitants. Therefore, Croatia is in the category of countries with the most efficient transplant system in the world [6]. Looking at the problem of donation and transplant medicine globally over the last fifteen years, the growth rate of voluntary donors is only 2% per year, which is insufficient given that the number of patients on waiting lists is growing by 15–20% per year. In Europe, the 35% of patients die waiting for a transplant, and only 30% of patients receive a transplant [7].

A lot of research was conducted on this topic. Although the majority of the population has a positive attitude towards organ donation, we are witnessing, for example, a constant lack of blood for transfusion. According to some authors, lack of knowledge, religious beliefs and superstition cause fear and mistrust associated with organ donation. (8). A prerequisite for success includes a positive attitude towards organ donation [8]. Organ donation is a sign of altruism and nobility by which a person expresses their desire and intention to donate any part of their body during their lifetime or after death, to a seriously ill person whose only form of treatment is a transplantation. Nurses, due to their position in the health care system, have an influence on the opinion of the rest of the population on health issues [9], and thus on organ donation as well.
A survey conducted in Croatia on 200 health care and non-health care workers showed no difference in the decision to donate organs between the two groups [10]. In a research conducted by Puharić and associates [11], most participants were unsure of the decision or would not donate their organs as well as the organs of family members. Some of the reasons for a negative attitude towards organ donation are familial [12], loss of body integrity [13], mutilation of the body and fear of complications [14], as well as concern about medical errors and organ trafficking [15].

In a study conducted among physicians and nurses, nurses stated that they have limited knowledge about organ donation due to insufficient education in their core curriculum, they have a need for more information on how to care for potential organ donors, more knowledge of neurological assessment as well as medical diagnosis and the legal implications of brain death. This would help them communicate better with potential donors and their families, while doctors expressed a positive attitude and more knowledge about organ donations. Therefore, in order to help patients with end-stage organ failure, medical staff should focus on ongoing support as well as special training of hospital staff involved in the donation process [16–19].

The goal of this research was to examine whether there are differences in the opinion and knowledge of nurses about organ donation regarding to their workplace (surgical and non-surgical specialties) and education.

**Methods**

This cross-sectional study was conducted in the period from September 2017 to January 2018. The participants were nurses working at the Department of Surgery, Department of Internal Medicine, Department of Psychiatry, Department of Pediatrics, Department of Oncology, Department of Infectious Diseases, Department of Otorhinolaryngology and Head and Neck Surgery, Department of Orthopedics, Department of Neurology and the Department of Maxillofacial and Oral Surgery of the University Hospital Center Osijek in Croatia. Nurses who have a transplanted organ or tissue and nurses who participate in organ transplants were excluded from the study. A total of 280 participants were included in the study. During the study, 30 participants refused to participate in the study and 27 submitted invalid questionnaires.

The study was conducted using an anonymous questionnaire developed by the researchers for the purpose of this study and based on existing data from the national registries and medical literature[11, 12]. The questionnaire consisted of three parts. The first part of the questionnaire referred to sociodemographic data (gender, age, education, years of work experience, job). The second part examined the opinion of nurses on organ donation (with Cronbach Alpha of 0.656), and the third part examined the knowledge of nurses on organ donation (with Cronbach Alpha of 0.667). In addition to the questionnaire, the participants were provided with a written explanation of the research and written instructions on how to complete the questionnaire. The participants were asked for written consent to participate in the research. Prior to statistical data processing, participants were divided into three groups
regarding the education: nurses with a high school education, bachelors and masters of nursing. Participants were divided into 4 age groups: from 18 to 29 years, from 30 to 45 years, from 46 to 55 years and 55 and older. Regarding the work experience, the participants were divided into 4 groups: from 1 to 9 years, from 10 to 19 years, from 20 to 29 years and from 30 and more years of work experience. Regarding the workplace, the participants were divided into 2 groups: surgical and non-surgical workplace.

**Statistical analysis**

Categorical data were presented in absolute frequencies. Differences in category variables were tested by the Chi-square test and, if necessary, by Fisher's exact test. The normality of the distribution of numerical variables was tested by the Shapiro-Wilk test. Numerical data were described by the median and borders of the interquartile range. Differences in numerical variables between groups were tested by the Mann-Whitney U test [20]. All P values are two-sided. The significance level was set to Alpha = 0.05. A statistical program MedCalc Statistical Software version 18.2.1 was used for statistical analysis [21].

**Results**

The study included 223 participants, 107 of whom (48%) were from non-surgical and 116 (52%) from surgical departments. There were slightly more women, and the majority of participants were 30 to 45 years of age. Regarding the work experience, 57 (25.6%) participants had up to 9 years of work experience, 57 (25.6%) from 10 to 19 years, 51 (22.9%) participants had 20 to 29 years of work experience, and 58 (26%) have had worked for 30 years and longer. Regarding the level of education, the majority of participants had a high school degree. 135 (61,1%) of participants were married (Table 1).
**Table 1**
Demographic characteristics of the participants

|                         | Number of (%) participants | P*  |
|-------------------------|---------------------------|-----|
|                         | Non-surgical | Surgical | Total     |
| **Gender**              |             |           |           |     |
| Male                    | 8 (7,5)     | 15 (12,9) | 23 (10,3) | 0,20 |
| Female                  | 99 (92,5)   | 101 (87,1)| 200 (89,7)|     |
| **Age**                 |             |           |           |     |
| 18–29 years             | 23 (21,5)   | 22 (19)   | 45 (20,2) | 0,69 |
| 30–45 years             | 44 (41,1)   | 55 (47,4) | 99 (44,4) |     |
| 46–55 years             | 26 (24,3)   | 22 (19)   | 48 (21,5) |     |
| 56 and older            | 14 (13,1)   | 17 (14,7) | 31 (13,9) |     |
| **Level of education**  |             |           |           |     |
| High school degree      | 73 (68,2)   | 80 (69)   | 153 (68,6)| > 0,99|
| Bachelor of science in nursing | 26 (24,3) | 28 (24,1) | 54 (24,2) |     |
| Masters in Nursing      | 8 (7,5)     | 8 (6,9)   | 16 (7,2)  |     |
| **Years of work experience** |         |           |           |     |
| Up to 9 years           | 27 (25,2)   | 30 (25,9)| 57 (25,6) | > 0,99|
| Up to 10 do 19 years    | 27 (25,2)   | 30 (25,9)| 57 (25,6) |     |
| Up to 20 do 29 years    | 25 (23,4)   | 26 (22,4)| 51 (22,9) |     |
| 30 and longer           | 28 (26,2)   | 30 (25,9)| 58 (26)   |     |
| Total                   | 107 (100)   | 116 (100)| 223 (100) |     |
| **Marital status**      |             |           |           |     |
| Single                  | 31 (29)     | 31 (27,2)| 62 (28,1)| 0,96 |
| Married                 | 64 (59,8)   | 71 (62,3)| 135 (61,1)|     |
| Divorced                | 8 (7,5)     | 9 (7,9)   | 17 (7,7)  |     |
| Widow                   | 4 (3,7)     | 3 (2,6)   | 7 (3,2)   |     |
| Total                   | 107 (100)   | 114 (100)| 221 (100) |     |

*χ² test
Regarding the religious beliefs 200 (90.5%) participants stated that they are religious, 8 (3.6%) were agnostics, and 13 (5.9%) were atheists. There was no significant difference in religious beliefs regarding the type of department (Table 2).

| Number of (%) participants | P* |
|---------------------------|----|
| **Beliefs**               |    |
| Agnostic                  | 4 (3.8) | 4 (3.5) | 8 (3.6) | 0.50 |
| Atheist                   | 4 (3.8) | 9 (7.8) | 13 (5.9) |
| Religious                 | 98 (92.5) | 102 (88.7) | 200 (90.5) |
| **Total**                 | 106 (100) | 115 (100) | 221 (100) |

*χ² test

After death, 158 (71.2%) participants would donate their organs, 5 (2.3%) would not donate, and 59 (26.6%) do not know or do not think about it. The most common reason for not donating organs for 22 (40%) participants was insufficient knowledge, for 12 (21.8%) participants it was important to know that their body will be whole at the time of burial, and 11 (20%) participants thought they were too old to donate. As a reason for not donating, 5 (9.1%) participants stated the fear that they would not be dead when their organs were taken, and three (5.6%) participants were afraid that their organs would “not get into the right hands” (Table 3).
| Would you donate your organs after death | Number of (%) participants | P* |
|-----------------------------------------|---------------------------|----|
|                                         | Non-surgical | Surgical | Total |
| Would you donate your organs after death |             |           |       |
| Yes                                     | 73 (68,9)    | 85 (73,3) | 158 (71,2) |
|                                        | 0,83         |           |       |
| No                                      | 3 (2,8)      | 2 (1,7)   | 5 (2,3)   |
| I do not know                           | 15 (14,2)    | 13 (11,2) | 28 (12,6) |
| I do not think about it                 | 15 (14,2)    | 16 (13,8) | 31 (14)   |
| Total                                   | 106 (100)    | 116 (100) | 222 (100) |

| The reason they do not want to donate their organs after death | Number of (%) participants | P* |
|---------------------------------------------------------------|---------------------------|----|
|                                                              | Non-surgical | Surgical | Total |
| Insufficient knowledge                                       | 13 (44,8)     | 9 (34,6) | 22 (40) |
| Do not trust their doctors                                  | 1 (3,4)       | 0        | 1 (1,8) |
| I am afraid I will not be dead the moment my organs are taken | 3 (10,3)      | 2 (7,7)  | 5 (9,1) |
| It is important to me to know my body will be whole at the time of burial | 6 (20,7)      | 6 (23,1) | 12 (21,8) |
| Think they are too old to donate                            | 5 (17,3)      | 6 (23,1) | 11 (20) |
| They are afraid that their organs will not get into the "right" hands | 1 (3,4)       | 2 (7,7)  | 3 (5,6) |
| Their disease prevents them from donating organs             | 0             | 1 (3,8)  | 1 (1,8) |
| Total                                                        | 29 (100)      | 26 (100) | 55 (100) |

*χ² test

Regarding the level of education, there were no significant differences in whether they considered transplantation a positive form of treatment. Significantly more high school graduates, and significantly less Masters of Nursing, think that organ donation is a good way to prolong life (χ² test, P = 0.04) (Table 4).
### Table 4
Participants opinion on organ transplantation in relation to the level of education

| Number of (%) participants |        |        |        | P*     |
|---------------------------|--------|--------|--------|--------|
|                           | High school degree | Bachelor of science in nursing | Master's degree in nursing |        |
| Do you consider organ transplantation a positive form of treatment |        |        |        |        |
| Yes                       | 138 (90,2) | 51 (94,4) | 13 (86,7) | 0,06   |
| I do not know             | 3 (2)     | 1 (1,9)  | 2 (13,3)  |        |
| I do not think about it   | 12 (7,8)  | 2 (3,7)  | 0 (0)     |        |
| Total                     | 153 (100) | 54 (100) | 15 (100) |        |
| Do you consider organ donation a selfless act of compassion for a person in need |        |        |        | 0,06   |
| Yes                       | 133 (87,5) | 51 (94,4) | 13 (81,3) |        |
| No                        | 4 (2,6)   | 1 (1,9)  | 1 (6,3)   |        |
| I do not know             | 3 (2)     | 2 (3,7)  | 2 (12,5)  |        |
| I do not think about it   | 12 (7,9)  | 0 (0)    | 0 (0)     |        |
| Total                     | 152 (100) | 54 (100) | 16 (100) |        |
| Do you consider organ donation a good way to prolong life |        |        |        | 0,04   |
| Yes                       | 143 (93,5) | 50 (92,6) | 13 (81,3) |        |
| I do not know             | 4 (2,6)   | 2 (3,7)  | 3 (18,8)  |        |
| I do not think about it   | 6 (3,9)   | 2 (3,7)  | 0 (0)     |        |
| Total                     | 153 (100) | 54 (100) | 16 (100) |        |
| Do you consider organ donation a negative way to prolong life |        |        |        | 0,11   |
| Yes                       | 4 (2,6)   | 0 (0)   | 0 (0)    |        |
| No                        | 137 (89,5)| 48 (90,6)| 14 (87,5)|        |
| I do not know             | 2 (1,3)   | 3 (5,7)  | 2 (12,5)  |        |
| I do not think about it   | 10 (6,5)  | 2 (3,8)  | 0 (0)     |        |
| Total                     | 153 (100) | 53 (100) | 16 (100) |        |

*χ² test
Significantly more high school graduates could not decide whether they would receive an organ of a deceased person if it was a possible method of treatment, while significantly more masters of nursing answered that they would not agree to receive an organ of a deceased person if it was a possible method of treatment. 29 (13.2%) participants had a donor card. 3 (1.4%) participants were registered as non-donors at the Ministry of Health without a significant difference in the level of education (Table 5).
### Table 5
Participants' willingness to receive an organ from another donor

|                              | Number of (%) participants | P*  |
|------------------------------|----------------------------|-----|
|                              | High school degree | Bachelor of science in nursing | Master's degree in nursing |
| Would you agree to receive an organ from a deceased person if this was a possible method of treatment | | | |
| Yes                          | 106 (69,3) | 37 (68,5) | 11 (68,8) | 0,002 |
| No                           | 2 (1,3) | 1 (1,9) | 3 (18,8) | |
| I do not know                | 33 (21,6) | 8 (14,8) | 1 (6,3) | |
| I do not think about it      | 12 (7,8) | 8 (14,8) | 1 (6,3) | |
| Total                        | 153 (100) | 54 (100) | 16 (100) | |
| Would you agree to receive an organ from a living donor if this was a possible method of treatment | | | |
| Yes                          | 101 (67,8) | 38 (70,4) | 9 (56,3) | 0,56 |
| No                           | 2 (1,3) | 0 (0) | 1 (6,3) | |
| I do not know                | 31 (20,8) | 11 (20,4) | 5 (31,3) | |
| I do not think about it      | 15 (10,1) | 5 (9,3) | 1 (6,3) | |
| Total                        | 149 (100) | 54 (100) | 16 (100) | |
| Would you agree to receive an organ from an unknown person | | | |
| Yes                          | 94 (63,1) | 35 (64,8) | 9 (56,3) | 0,88 |
| No                           | 2 (1,3) | 1 (1,9) | 1 (6,3) | |
| I do not know                | 36 (24,2) | 11 (20,4) | 4 (25) | |
| I do not think about it      | 17 (11,4) | 7 (13) | 2 (12,5) | |
| Total                        | 149 (100) | 54 (100) | 16 (100) | |
| Have you talked to family/friends about organ donation/non-donation | | | |
| Yes                          | 63 (42,6) | 24 (44,4) | 9 (60) | 0,55 |
| No                           | 75 (50,7) | 29 (53,7) | 6 (40) | |
| I do not know                | 3 (2) | 1 (1,9) | 0 (0) | |
| I do not think about it      | 7 (4,7) | 0 (0) | 0 (0) | |

*χ² test
### Table 6
Possession of a donor card, and registration of non-donation of organs in relation to departments

|                        | Number of (%) participants |  \( \chi^2 \) test |
|------------------------|----------------------------|---------------------|
|                        | High school degree         | Bachelor of science in nursing | Master's degree in nursing |
| Have a donor card       | 18 (12,1)                  | 8 (15)              | 3 (19)              | 0,70 |
| They are registered as non-donors at the Ministry of Health | 3 (2)                      | 0                   | 0                   | 0,48 |
| Total                  | 148 (100)                  | 54 (100)            | 15 (100)            |      |

29 (13.2%) participants have a donor card, significantly more, 20 of them (17.9%), from surgical departments (Fisher’s exact test, \( P = 0,04 \)). 3 (1.4%) participants were registered as non-donors at the Ministry of Health (Table 6).

**Most participants, 86 (39.3%), stated that, during their lifetime, they would donate an organ (part of the liver or kidney) only to close family members, and 71 (32.4%) would donate to family members and close friends, without significant differences regarding the level of education (Table 7).**
Table 7

Participants regarding to whether they would donate an organ during their lifetime

| Would you donate an organ (part of the liver or kidney) to another person during your lifetime | Number of (%) participants |  |
|---|---|---|---|
| | High school degree | Bachelor of science in nursing | Master's degree in nursing |
| Only to their child | 25 (16,6) | 8 (15,1) | 3 (20) |
| Only to close family members | 57 (37,7) | 24 (45,3) | 5 (33,3) |
| Family members and close friends only | 52 (34,4) | 15 (28,3) | 4 (26,7) |
| To anyone in need | 16 (10,6) | 5 (9,4) | 3 (20) |
| No one | 1 (0,7) | 1 (1,9) | 0 (0) |
| Total | 151 (100) | 53 (100) | 15 (100) |

*χ² test

206 (99.5%) participants stated correctly that the transplantation is the procedure of transplanting organs (kidney, heart, liver, cornea and other organs) and/or tissues (blood, bone marrow) from living or dead donors to recipients. The understanding of the law of presumed consent, which is valid in Croatia, and according to which every citizen is a potential recipient/donor, unless they have declared otherwise during their lifetime, was significantly higher among participants from surgical departments compared to non-surgical nurses (P < 0,001). 201 (97.6%) participants stated correctly that although the law of the Republic of Croatia does not prescribe the obligation to seek a permit for the explantation of the organs of a deceased person, in practice the opinion of the family is respected. The majority of the participants knew that the Croatian donor network is an organization that was created at the initiative of a group of doctors and their friends, with the intention of promoting and donating organs to the public. The fact that the Republic of Croatia is a full member of the transplant organization World Transplant International Foundation, was known to 195 (95.6%) participants.

147 (72.1%) participants knew that the majority of patients on an organ transplant list do not receive an organ, and 168 (83.2%) stated that it is incorrect that a person diagnosed with brain death can recover. 122 (59,2%) participants knew that the chances are equal for both poor and wealthy person to get an organ for transplantation. That it is incorrect that most of today's religions and churches have a negative attitude towards organ donation, stated 109 (53.7%) participants. Significantly more (P = 0,03) participants from non-surgical departments knew that the number of organ transplants from deceased individuals is a measure of the development of society (Table 8).
Table 8

Distribution of participants according to their knowledge of legislation on organ donation

| Number of (%) participants | Non-surgical | Surgical | Total   | P*     |
|----------------------------|--------------|----------|---------|--------|
|                             |              |          |         |        |
| Transplantation is the process of transplanting organs (kidney, heart, liver, cornea and other organs) and/or tissues (blood, bone marrow) from living or dead donors to recipients. |
| * Correct                   | 98 (99)      | 108 (100)| 206 (99,5)| 0,48   |
| Incorrect                   | 1 (1)        | 0        | 1 (0,5)  |        |
| The law of presumed consent, which is valid in Croatia, declares that every citizen is a potential recipient/donor, unless they have specifically registered otherwise during their lifetime. |
| * Correct                   | 66 (67,3)    | 96 (88,9)| 162 (78,6)| < 0,001|
| Incorrect                   | 32 (32,7)    | 12 (11,1)| 44 (21,4)|        |
| Although the law of the Republic of Croatia does not include the obligation to request a permit for explantation of the organs of a deceased person, in practice the opinion of the family is respected. |
| * Correct                   | 94 (95,9)    | 107 (99,1)| 201 (97,6)| 0,19   |
| Incorrect                   | 4 (4,1)      | 1 (0,9)  | 5 (2,4)  |        |
| The Croatian Donor Network is an organization created at the initiative of a group of doctors and their friends, with the intention of promoting and donating organs in the public. |
| * Correct                   | 69 (73,4)    | 85 (80,2)| 154 (77) | 0,17   |
| Incorrect                   | 25 (26,6)    | 21 (19,8)| 46 (23)  |        |
| The Republic of Croatia is a full member of the transplant organization World Transplant International Foundation. |
| Correct                     | 94 (95,9)    | 101 (95,3)| 195 (95,6)| > 0,99 |
| * Incorrect                 | 4 (4,1)      | 5 (4,7)  | 9 (4,4)  |        |
| The person can indicate on the donor card which organs they want or do not want to donate. |
| Correct                     | 72 (73,5)    | 72 (67,9)| 144 (70,6)| 0,44   |
| * Incorrect                 | 26 (26,5)    | 34 (32,1)| 60 (29,4)|        |
| Most people who wait for an organ transplant get an organ. |
| Correct                     | 26 (27,4)    | 31 (28,4)| 57 (27,9) | 0,88   |
| * Incorrect                 | 69 (72,6)    | 78 (71,6)| 147 (72,1)|        |
| It is possible for a person who has been diagnosed with brain death to recover. |

*correct answers are marked with asterix
| Number of (%) participants | P* |
|---------------------------|----|
|                           | Non-surgical | Surgical | Total |
| Correct                   | 20 (21,1)    | 14 (13,1) | 34 (16,8) | 0,09 |
| * Incorrect               | 75 (78,9)    | 93 (86,9) | 168 (83,2) |

There is an equal chance that a poor person as well as a wealthy person will receive an organ for transplantation.

| Correct | 52 (53,1) | 70 (64,8) | 122 (59,2) | 0,09 |
| Incorrect | 46 (46,9) | 38 (35,2) | 84 (40,8) |

Most religions and churches today have a negative attitude towards organ donation.

| Correct | 42 (43,8) | 52 (48,6) | 94 (46,3) | 0,57 |
| Incorrect | 54 (56,3) | 55 (51,4) | 109 (53,7) |

The number of organ transplants from deceased individuals is a measure of the development of the society.

| Correct | 68 (69,4) | 59 (54,6) | 127 (61,7) | 0,03 |
| Incorrect | 30 (30,6) | 49 (45,4) | 79 (38,3) |

*correct answers are marked with asterix

The mean (median) value of correct answers was 7 (interquartile range of 6 to 8 correct answers). Participants from surgical departments had significantly more correct answers (P = 0,04) (Table 9).

| Number of correct answers | 6 (6–8) | 7 (6–8) | 7 (6–8) | 0,04 |
|---------------------------|--------|--------|--------|

**Table 9**

Knowledge of legislation on organ donation in relation to the type of department

| Median (interquartile range) | P* |
|------------------------------|----|
| Non-surgical | Surgical | Total |
| Number of correct answers | 6 (6–8) | 7 (6–8) | 7 (6–8) |

*Mann-Whitney U test

Significantly less masters of nursing responded correctly that transplantation is the procedure of transplanting organs (kidney, heart, liver, cornea and other organs) and/or tissues (blood, bone marrow) from living or dead donors to recipients (Fisher's exact test, P = 0.001) compared to participants with a high school education or bachelors of nursing. Also, the masters of nursing had significantly more incorrect answers regarding the question if the Republic of Croatia was a full member of the transplant organization of the World Transplant International Foundation (Fisher's exact test, P = 0.005). There were no significant differences in knowledge regarding the remaining questions (Table 10).
Table 10
Knowledge of legislation on organ donation in relation to the level of education

| Number of (%) participants | High school degree | Bachelor of science in nursing | Master's degree in nursing | P* |
|----------------------------|--------------------|--------------------------------|---------------------------|----|
| *Correct                   | 144 (100)          | 49 (100)                       | 13 (92,9)                 | 0,001 |
| Incorrect                  | 0 (0)              | 0 (0)                          | 1 (7,1)                   |    |

Transplantation is the process of transplanting organs (kidney, heart, liver, cornea and other organs) and/or tissues (blood, bone marrow) from living or dead donors to recipients.

*Correct 110 (76,9) 40 (81,6) 12 (85,7) 0,63
Incorrect 33 (23,1) 9 (18,4) 2 (14,3)

The law of presumed consent, which is valid in Croatia, declares that every citizen is a potential recipient/donor, unless they have specifically registered otherwise during their lifetime.

* Correct 140 (97,2) 48 (98) 13 (92,9) 0,76
Incorrect 4 (2,8) 1 (2) 1 (7,1)

Although the law of the Republic of Croatia does not include the obligation to request a permit for explantation of the organs of a deceased person, in practice the opinion of the family is respected.

* Correct 112 (81,2) 31 (64,6) 11 (78,6) 0,06
Incorrect 26 (18,8) 17 (35,4) 3 (21,4)

The Croatian Donor Network is an organization created at the initiative of a group of doctors and their friends, with the intention of promoting and donating organs in the public.

* Correct 136 (96,5) 48 (98) 11 (78,6) 0,005
Incorrect 5 (3,5) 1 (2) 3 (21,4)

The Republic of Croatia is a full member of the transplant organization the World Transplant International Foundation.

Correct 100 (70,4) 34 (69,4) 10 (76,9) 0,87
Incorrect 42 (29,6) 15 (30,6) 3 (23,1)

The person can indicate on the donor card which organs they want or do not want to donate.

Correct 39 (27,7) 12 (24,5) 6 (42,9) 0,40
Incorrect 42 (29,6) 15 (30,6) 3 (23,1)

Most people who wait for an organ transplantation get an organ

* Fisher's exact test
| Number of (%) participants | P* |
|----------------------------|----|
| **High school degree**     | **Bachelor of science in nursing** | **Master's degree in nursing** |
| * Incorrect                | 102 (72,3) | 37 (75,5) | 8 (57,1) |
| Correct                    | 27 (19,1)  | 6 (12,2)  | 1 (7,7)  |
| * Incorrect                | 114 (80,9) | 43 (87,8) | 12 (92,3) |

It is possible for a person who has been diagnosed with brain death to recover.

| * Correct | 84 (58,7) | 27 (55,1) | 11 (78,6) |
| Incorrect | 59 (41,3) | 22 (44,9) | 3 (21,4) |

There is an equal chance that a poor person, just like a wealthy person, will receive an organ for transplantation.

| * Correct | 73 (51,8) | 18 (36,7) | 3 (21,4) |
| Incorrect | 67 (47,5) | 31 (63,3) | 11 (78,6) |

Most religions and churches today have a negative attitude toward organ donation.

| * Correct | 88 (61,5) | 32 (65,3) | 7 (50) |
| Incorrect | 55 (38,5) | 17 (34,7) | 7 (50) |

The number of organ transplants from deceased people is a measure of the development of society.

| * Fisher's exact test |

Masters of nursing had significantly more correct answers (median 8 [interquartile range from 7 to 9]) compared to participants with a high school degree or bachelors of science in nursing (Kruskal-Wallis test, P = 0,009) (Table 11).

**Table 11**

| Knowledge of legislation on organ donation in relation to the level of education |
|-------------------------------|--------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| **Median (interquartile range)** | **High school degree** | **Bachelor of science in nursing** | **Master's degree in nursing** | **P*** |
| Number of correct answers     | 7 (6–8)          | 7 (6–8)          | 8 (7–9)          | 0,009 |

*Kruskal-Wallis test*
Discussion

Although in this study, conducted among nurses, most participants were female, between 30 and 40 years of age, with a high school degree, married and religious, the aforementioned demographic distribution is a realistic reflection of the total number of registered nurses in the Republic of Croatia.

According to the Croatian Institute of Public Health in the Republic of Croatia, in 2017, the total number of nurses employed in health care institutions was 32,539, 28,859 of which were women and 3,680 were men. The number of nurses with a high school degree was 25,505, 6,789 had bachelor’s degree, while 245 were masters of nursing [22].

The results of our study obtained for the purpose of assessing the opinion and knowledge of nurses about organ donation, show that most of the participants would donate their organs after death. Given the positive opinion about organ donation, it is not surprising that the participants of this study believed that transplantation is a positive form of treatment and organ donation was considered a selfless act of compassion for a person in need.

Nurses all over the world have a positive attitude towards organ donation [23, 24, 25, 26, 27, 28]. Research conducted in Spain, shows that nurses have a positive attitude towards organ donation [24]. A study conducted in 12 hospitals in Latin America and Spain shows a positive attitude of health professionals about organ donation in Cuba and in Costa Rica, Mexico, and Spain [29]. Equally, previous Croatian study among health and non-health care workers Bjelovar-Bilogora County showed a positive attitude of health staff towards organ donation [12].

Some of our participants did not know whether they would donate an organ or did not think about organ donation. The explanations for such attitude were insufficient information, the knowledge that their body would be whole at the time of burial, some considered themselves too old to donate, were scared that the organ will not get into the "right hands" or they feared that they would not be dead at the time of organ harvesting.

Some of the participants who did not understand whether they would donate an organ thought that they were insufficiently informed about organ donation. Participants who did not know whether they would donate an organ due to insufficient information were also mentioned in previous studies. A study conducted in Turkey on nurses employed in surgical departments, states insufficient information as one of the reasons for not donating organ [30]. Some of our participants did not know if they would donate an organ because it was important for them that the body would be whole at the time of burial. In the literature, these reasons are associated with religion. Most of our participants were religious. However, the majority of Croatian population is Catholic and given that the Catholic Church has a positive attitude regarding organ donation, these reasons remain somewhat unclear [31].

All the aforementioned reasons of our participants for not donating organs, could be solved by education. Increasing the knowledge of health professionals about organ donation and transplantation increases
the possibility of a larger number of donors [32].

This study indicates that organ donation is a topic that is difficult to talk about and poorly discussed. Most participants did not talk to their family or friends about organ donation. Some authors state that people believe that if they discuss an unwanted topic, that this is exactly what will happen to them suddenly [33]. A research conducted in Sweden on nurses working in intensive care units, also showed that a large number of participants did not talk to family and friends about organ donation [34]. At the time of brain death, the decision to donate organs always falls on the family members, so the authors emphasize and promote the conversation about organ donation with family members [33]. It is also important to state that 90% of the families who gave permission to donate organs knew the opinion of a person who was declared brain dead [35].

The results of this study show that most participants would receive a deceased person's organ as well as one from a living donor. Most participants would receive an organ from an unknown person as well as an organ from a person of another religion.

A very small number of our participants had a donor card, significantly, more of whom were nurses employed in surgical departments. A very small number of participants were registered as non-donors at the Ministry of Health. Each of us can become an organ donor or recipient at any time. Since the law of presumed consent is valid in Croatia, the donor card does not have its legal weight, but it makes it easier for the family of a person who is possibly dead to make a decision on donation. The donor card, which is recognizable in our country, certainly contributes to the promotion of organ donation [36]. In some countries of the world (Singapore, Israel) priority in the access of organs for transplantation is given to patients who have previously declared themselves as donors [37–39]. Such situation can certainly further motivate the population on having the donor card.

Negative opinions of nurses about organ donation mostly come from less developed countries or countries of other culture and religion. Reasons for not donating are mostly religious, fear of surgery, mutilation of the body, financial, family disagreement, existence of the black market, ignorance and distrust of state policy, as well as existence of various myths about organ donation [40–45].

Since it is a well-known that knowledge is power, it was logical to examine the level of knowledge of the participants in addition to the opinion on organ donation. The median value of the number of correct answers of our participants was average. Significantly more correct answers were given by Masters of nursing compared to participants with a high school education or a bachelor degree, and especially from those working in surgical departments.

The fact that transplantation is a procedure of transplanting organs (kidney, heart, liver, cornea and other organs) and/or tissues (blood, bone marrow) from living or dead donors to recipients, was known to a very high percentage of our participants.
A high number of participants, more from surgical departments, knew that the Law of presumed consent is valid in Croatia. Nurses from non-surgical departments were less familiar with the aforementioned law, which can be related to the lack of information since the same group of participants, cited lack of information as the reason for not donating organs.

Although the law of the Republic of Croatia does not include the obligation to seek permission to donate the organs of a deceased person, in practice the attitude of the family is respected, and a large number of participants were familiar with this fact.

A high percentage of participants believed that Croatia is not a full member of the World Transplant International Foundation. This data is surprising since Croatia has been a full member of the Eurotransplant International Foundation since 2007, and it was a hot topic discussed in all media in the year in which our study was conducted. The Masters of Nursing had significantly more incorrect answers that the above statement.

Participants in our study were unfamiliar with the fact that the owner of the donor card cannot list the organs they wish to donate.

Participants were familiar with the fact that most people waiting for an organ transplant do not get an organ. In the United States of America, a person is added to the national transplant waiting list approximately every 10 minutes, while 22 people die daily while waiting for a transplant [46].

A large number of participants know that it is impossible for a person diagnosed with brain death to recover.

It is very concerning that just a little more than half of the participants knew that there is an equal chance for a poor and wealthy person to receive an organ for transplantation. This answer can be put in connection with the already mentioned data from this research, which showed that a large number of participants were afraid that their organ will not get into the "right hands".

Just over half of participants consider the claim that most religions have a negative attitude towards organ donation to be incorrect. This result can be attributed to the fact that more than 50% of believers were not aware of the attitude of their faith towards donation in Croatia (8). The similar situation is in the USA, where Catholics are less likely to declare themselves as donors [47].

Insufficient number of our participants knew that the number of organ transplants from deceased individuals is a measure of the development of society. The participants from non-surgical departments knew this significantly compared to nurses from surgical departments.

This research was conducted in order to study the opinion and knowledge about organ donation of Croatian nurses and possible reasons for not donating organs. Since nurses are an important group of people who can form an opinion in the patient population, their negative attitude on organ donation can also negatively affect society. In this study, we found that the level of knowledge about organ donation is
average, but we also believe that the level of knowledge should be higher given the fact that the participants were educated and registered nurses. According to some authors, continuous education of nurses is necessary to improve skills and knowledge, as well as sensitivity to cultural, ethical, social and religious issues in order to propagate the field of organ donation. [40]. Since medical workers are the most important advisors and promoters of organ donation, it seems that the educational curriculum should be improved in order to change the opinion and behavior on this topic [48]. Some authors state that organ donation is a unique social activity where there is a direct impact of the health professionals on to a wide range of patients [49]. Therefore, it is important to increase awareness and knowledge on the topic, as well as to provide social and mental support to the included parties [31].

There are several limitations to the study. The sample size was small and reflect the attitudes and knowledge of nurses in a single medical center, therefore further research is needed in other medical centers to obtain the attitudes and knowledge of nurses about organ donation in Croatia. The questionnaire developed by the authors was the only instrument used to conduct the research in this study.

### Conclusion

According to the data of our study, the following can be concluded:

- A large number of participants had a positive opinion about organ donation and reception, and would donate their organs after death
- There were no significant differences in opinions about organ donation in relation to whether participants worked in the surgical or non-surgical department
- Participants’ knowledge of organ donation was average, however the nurses from surgical departments had significantly more correct answers
- Significantly more high school graduates and significantly fewer Masters of Nursing believed that organ donation is a good way to prolong life
- Masters of Nursing had significantly more correct answers than participants with a high school degree or bachelors of nursing

In conclusion, the results of this study indicate the need for additional education of nurses. This can be achieved through continuous training at the level of the institution itself, since the University Hospital Osijek is a transplantation and explantation center with a network of coordinators and nurses working in the process of organ donation, who can transfer their knowledge to other nurses through dedicated education and therefore change their opinion and behavior towards organ donation.

### Declarations

#### Ethics approval and consent to participate
The research was conducted after the approval of the Ethics Committee of University Hospital Center Osijek (number: R1-15851-2/2017.). All participants were informed about the purpose, goal of the research and the anonymity of the data in it, and their participation was voluntary. The research was conducted in accordance with ethical principles and human rights in biomedical research.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

AN, SP, SM and NF developed the questionnaire. AN, SP, SM, NF and ZG conducted the survey and collected the data. SP, TT, AMS and KK analyzed and interpreted the patient data. AN, SP, TT, AMS and KK were major contributors in writing the manuscript. All authors read and approved the final manuscript.

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