Can education alter attitudes and knowledge about organ donation?

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Can education alter attitudes and knowledge about organ donation?

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Abstract

Objective: The emergence of evidence suggests that student nurses commonly exhibit concerns about their lack of knowledge about organ donation and transplantation. Formal training about organ donation has been shown to positively influence attitude and ability to participate in the organ donation system. The focus of this study is to determine whether attitudes of student nurses towards organ donation as well as their level of knowledge alter after a programme of study.

Design: Questionnaire-based study using a pre-test/post-test design.

Setting: Participants were recruited from a university based in Northern Ireland during the period of February to April 2011.

Participants: 100 pre-registration nurses (female:male = 96:4) aged 18 to 50 years (mean [SD] 24.3 [6.0] years).

Results: Participants' knowledge about the suitability of organs that can be donated after death, methods available to register organ donation intentions, organ donation laws, concept of brain death and the likelihood of recovery after brain death, improved after the course of study. Changes in attitude were also observed in relation to participants' willingness to discuss organ donation intentions and improved support for a system of informed consent.

Conclusions: The results provide support for the introduction of a course or programme that helps inform and guide student nurses about important aspects of organ donation.

Article focus:

- To determine the level of knowledge of student nurses about organ donation
- To investigate whether attitudes towards and knowledge about organ donation in a cohort of student nurses alters after a course of study

Key messages:

- Knowledge of participants significantly improved in several key areas.
- Attitude was positively influenced by involvement in the programme.
- The programme was successful in demonstrating the importance of providing formal instruction about organ donation and transplantation.

Strengths and limitations:

- The strengths of this article are its novelty, as this is the first UK-based study that highlights the importance of formal instruction and demonstrates the merits of knowledge-gains in key areas related to organ donation and transplantation.
- The limitations of this article are that findings were based on perceived knowledge rather than on actual knowledge and on the use of self-reported measures to determine change in attitude.

Background

Organ donation is a unique social activity that has a direct influence on the delivery of health care to a wide range of patients. Transplantation and its known therapeutic benefits are not possible without the cooperation and support of health care professionals, government and society as a whole. Transplantation is the treatment of choice that improves life expectancy and quality of life.[1-2] In addition, transplantation contributes in helping to reduce health care expenditure.[2-7] The donation and transplantation system represents a complex practice[8] and is dependent on an individual's attitude, social structures, cultural practices and religious beliefs. Although approximately 90% of the general public report a favourable attitude towards organ donation,[9] less than 55% of relatives of potential donors ultimately provide consent for donation.[10] These inconsistencies demonstrate that successful organ procurement fundamentally requires action on the part of the health care professional. Therefore, the attitude and approach of those health care professionals who procure organs for transplantation should not be dismissed as inconsequential. Nurses represent the largest group of health care professionals in this process [11] and are often the critical link within the transplantation system.[12] Although it is recognised that not all nurses are in a position to initiate the organ donation process, evidence suggests that nurses recognise that they have a crucial role to play in helping to support the process of organ donation and transplantation and in helping to raise its profile amongst the public.[13-14]

The emergence of evidence tends to suggest that student nurses commonly exhibit concerns about their lack of knowledge and experience in dealing adequately with all aspects of organ donation and transplantation.[15-18] This is principally due to the way in which organ donation and transplantation training is being delivered in a non-systematic manner from within subjects and courses.[19] Garde and Corbett noted that student nurses based in the USA frequently misunderstood the concept of brain death.[18] Anker et al. found that important issues in relation to brain death and cardiac death continue to be neglected, with performance on how to initiate the organ donation discussion remaining relatively poor.[19] This limited knowledge and grasp of certain fundamental elements of the organ donation process is a reflection on the amount of time that is dedicated towards organ donation and transplantation within core curricula.[19]

It has been acknowledged that formal training about organ donation can successfully impact upon attitude and ability to participate in the organ donation system.[20-21] Further improving knowledge about the organs suitable for donation, the methods available for registration and the regulations that govern the process of organ donation in the UK can help remove significant barriers and encourage engagement in pro-social behaviours.[22] It is therefore important to ensure that those who may influence rates of transplantation are prepared and properly informed about the processes involved. The objective of this study is to determine knowledge and attitudes of student nurses towards organ donation before and after a course of study in order to assess whether this may result in changes that could lead to improved organ donation rates. It is hypothesized that a programme of study can significantly improve knowledge and positively influence attitudes towards organ donation.

Methods

Design

A pretest-posttest design, involving two sets of cross-sectional data on the same population, was chosen to establish the level of knowledge gained and the impact of this knowledge on attitude.

Ethics

Approval was sought and subsequently granted from the institutional review board at the University of Ulster. The researcher (DM) visited the University prior to starting the study so that background information could be provided and to respond to any queries. Participation in the study was voluntary and without any form of compensation. Informed consent was obtained from all participants.

Setting and participants

Convenience sampling techniques were used to recruit pre-registered nursing students undertaking a full-time degree course leading to the award of BSc. (Hons). Participants were second year students in the third trimester of a three year course of education at the University of Ulster, Northern Ireland. This sample was chosen because the population of Northern Ireland is relatively homogenous in terms of ethnicity, religion and socio-economic factors. The cohort had recently completed a considerable proportion of their elective placements in general and specialist hospital care.

Measures

- *The questionnaire*

Participants completed a quantitative questionnaire based on previous frameworks.[23-26] The questionnaire was extended to include additional concepts: attitude to registration and donation; knowledge on brain death; and legislation. Validation of the questionnaire content was undertaken by several academic experts. The questionnaire gathered demographic information on gender, age, country of birth, marital status and religious affiliation. Knowledge of the organ donation process was measured using nine items and attitude was assessed with eight items (Table 1).

Table 1: Questionnaire items

Attitudinal items
Have you registered to be an organ donor? (yes/no)
Would you consider becoming an organ donor? (yes/no/I do not know)
Have you discussed your organ donation intentions with your family? (yes/no)
Becoming an organ donor makes me think about my own death?[24] (strongly agree/agree/disagree/strongly disagree)
I would support a change to the current organ donation system?[24] (strongly agree/agree/disagree/ strongly disagree)
The law should be changed so that everyone is an organ donor unless they say no?[25] (strongly agree/agree/disagree/strongly disagree)
The law should be changed so that everyone is encouraged to formalise their donation intentions? (strongly agree/agree/disagree/strongly disagree)
The government should provide financial help to those families who donate? (strongly agree/agree/disagree/strongly disagree)
Knowledge-based items
Of which method of registration are you aware?[23] (donor card/national register/driving license/GP surgery/electoral roll/passport/Boots The Chemist)
What do you think are the benefits of donation?[26] (to help improve another person's quality of life/to save another person's life/to help families through the grieving process/it is a good thing for society)
Which of the following do you think can be donated after death?[26] (eyes/heart/kidneys/liver/lungs)
By signing a donor card, doctors might do something to me before I am really dead?[24] (strongly agree/agree/disagree/strongly disagree)
The possible misuse of my organs after death makes me feel less supportive of organ donation?[26] (strongly agree/agree/disagree/strongly disagree)
Does your religion allow organ donation?[26] (yes/no/I do not know)
Are you aware of any laws that control organ donation?[26] (yes/no/I do not know)
Would you consider a person who is declared brain dead but still has a beating heart as being dead?[24] (yes/no/I do not know)
How likely do you think it is that a brain dead person with a beating heart might recover and live? (very likely/likely/unlikely/very unlikely)

- *The programme of study*

The programme of study was delivered during a 33-hour module within the degree course that encouraged participants to interact and engage in discussion wherever possible. The material was designed to incorporate important issues relating to the clinical care of the potential organ donor as well as from the perspective of the transplant patient. The programme placed an emphasis on the following areas: criteria for organ donation, nursing the potential organ donor and transplant patient, neurological assessment and management of brain injury, medical and legal diagnosis of brain death, effective communication and ethical aspects of organ donation and transplantation.

Data collection and analysis

Data was collected immediately before (February 2011) and after completion of the module (April 2011). To determine whether the sample size chosen was adequate, a post-hoc power analysis was conducted. The Exact tests option was chosen from the test family and two dependent groups (McNemar) selected as the statistical test in G*Power Version 3.17. The power analysis demonstrated that the sample size had an acceptable level of power (0.80) and was deemed adequate for the analysis.

Descriptive statistics were used to assess demographic information, with McNemar test chosen as the most appropriate tool for analysing dichotomous items from matched pairs of participants[27] using the Statistical Package for Social Sciences Version 19. It was decided that Yates' correction for continuity should not be applied within a two by two contingency table. This is based on evidence suggesting that the corrected Chi-square statistic is overly conservative and that the conventional statistic will provide adequate control over Type I errors.[28-29] A significant McNemar χ^2 is an indication of a change in knowledge or attitude between baseline and follow-up measurement.

Results

Initially, 109 participants completed a questionnaire at baseline. Of these participants, 100 (91.7%) also completed a follow-up questionnaire; 9 (8.3%) failed to do so and were subsequently excluded from any further analysis. Of the participants who completed both questionnaires, 96 (96.0%) were female and this reflects the gender base of the profession.[30] Ages ranged from 18 to 50 years (mean [SD] 24.3 [6.0] years). The majority of participants (n = 82, 82.0%) were in their third decade, 5 (5.0%) in their second decade, 10 (10.0%) in their fourth decade, 1 (1.0%) in their fifth decade and 2 (2.0%) in their sixth decade. All participants reported religious (Christian) beliefs. Responses obtained from participants demonstrated significant changes in several key areas (Table 2). Knowledge about the suitability of organs that can be donated after death improved considerably (McNemar χ^2 = 23.059, exact p <0.001) with 28.0% more participants able to correctly identify which organs are suitable for donation at follow-up compared to baseline measurement (95% CI = 17.5 to 38.1). In particular, there was an improvement of knowledge in relation to the donation of corneal tissue: 96.0% of participants correctly understood at follow-up that the cornea is a tissue that can be successfully donated after death, compared with 72.0% at baseline (McNemar χ^2 = 19.200, exact p <0.001; 95% CI = 15.3 to 32.4). There was an increase of 24.0% in the number of participants who understood the methods available to register organ donation intentions subsequent to baseline measurement (McNemar χ^2 = 24.000, exact p <0.001; 95% CI = 15.3 to 32.4).

Following completion of the study, there was a rise in the number of participants who understood the laws relating to organ donation (McNemar χ^2 = 11.636, exact p = 0.001; 95% CI = 7.0 to 25.3) and a statistically significant improvement in knowledge about brain death (McNemar χ^2 = 11.560, exact p = 0.001; 95% CI = 7.5 to 26.4) as well as the likelihood of recovery following a diagnosis of brain death (McNemar χ^2 = 5.538, exact p = 0.019; 95% CI

= 1.9 to 22.0) (Table 2). However, 11.0% of the cohort continued to express doubts about this matter and believed that a person declared brain dead might subsequently recover and lead a normal life.

Table 2: Knowledge about organ donation

	Total sample, n (%)		
	Pretest	**Posttest**	**p-value**
Suitability of organs for donation	67 (67.0)	95 (95.0)	<0.001
Methods available to register consent	18 (18.0)	42 (42.0)	<0.001
Existence of organ donation laws	5 (5.0)	21 (21.0)	0.001
Knowledge of brain death	14 (14.0)	31 (31.0)	0.001
Knowledge of brain death recovery	77 (77.0)	89 (89.0)	0.019
Religious support of organ donation	82 (82.0)	88 (88.0)	0.157
Benefits of organ donation	87 (87.0)	93 (93.0)	0.157
Medical distrust	17 (17.0)	17 (17.0)	0.100
Misappropriation of organs	53 (53.0)	51 (51.0)	0.752

No statistically significant change was found with regard to: religion and its supporting role in organ donation (McNemar χ^2 = 2.000, exact p = 0.157); perceived benefits of organ donation (McNemar χ^2 = 2.000, exact p = 0.157); medical distrust (McNemar χ^2 = 0.000, exact p = 1.000); and misappropriation of donated organs (McNemar χ^2 = 0.100, exact p = 0.752) (Table 2).

There was a small, non-significant increase in the number of participants who indicated that they had a greater intention to register as an organ donor (6.0% rise from baseline measurement) and in participants who reported being currently registered (3.0% rise from baseline measurement). At follow-up, a greater number of participants (14.0%; 95% CI = 6.9 to 20.8) indicated that they had discussed their organ donation intentions with their family or friends compared to baseline measurement (McNemar $\chi^2 = 14.000$, exact $p < 0.001$) (Table 3). The majority of participants at both baseline (72.0%) and follow-up (70.0%) associated the process of registering as an organ donor with recognition of their own mortality (Table 3). A greater number of participants (16.0%; 95% CI = 4.7 to 26.8) favoured an informed system of consent at follow-up rather than opting for a change in legislation (McNemar $\chi^2 = 7.529$, exact $p = 0.006$). Support for the introduction of a government incentive scheme was low at baseline (28.0%) and at follow-up (27.0%) (Table 3).

Table 3: Attitude toward organ donation

	Total sample, n (%)		
	Pretest	**Posttest**	**p-value**
Current registration	33 (33.0)	36 (36.0)	0.405
Willing to consider registration	74 (74.0)	80 (80.0)	0.221
Discussed donation intentions	39 (39.0)	53 (53.0)	<0.001
Mortality and organ donation	72 (72.0)	70 (70.0)	0.695
Support change to donation system	80 (80.0)	64 (64.0)	0.006
Support incentive schemes	28 (28.0)	27 (27.0)	0.835

Discussion

The results from this study support the conclusions of previous work that the opinions and attitudes of student nurses are positively influenced by education on the topic.[20-21] Statistically significant changes in knowledge on fundamental aspects of organ donation occurred in relation to the suitability of organs that can be donated after death, methods available to register organ donation intentions, organ donation laws, concept of brain death and the likelihood of recovery following a diagnosis of brain death.

Education about organ donation is not routinely incorporated into the nursing degree curricula. A course of study needs to be objective and sufficiently informative to encourage independent thought that will lead to measured decisions to donate and can be conveyed with justification to relatives. Spain has been accredited as the nation with the highest rate of deceased organ donation.[31] The Spanish model provides education to health care professionals, helping them to engage fully with organ donation and transplantation and has directly resulted in a continuous rise in the number of families willing to provide consent to donation.[32]

It needs to be recognised that whilst the individual decision regarding whether or not to donate should be paramount, in many cases the final decision rests with relatives. Indeed, the most common reason for lack of organ donation is a failure to obtain consent from the relatives of the deceased.[33] This is attributed to families not being made fully aware of the latter's prior wishes.[34-36] Communicating an intention to donate to family members is frequently omitted.[37-38] This may be the reason that over half of all families approached for organ donation in the UK typically refuse to provide consent.[10] The results of this study indicate that participants were more likely to engage in discussion about organ donation with family members after the course of study. The programme may have motivated such discussions or it could be that the emotive aspects of a topic like organ donation may have prompted discourse.

This study has shown that even within a small group and after a relatively short course of study, the understanding about organ donation and the processes involved can be significantly improved, leading to consideration about donation of organs and decisions with relatives. This study aimed to capture any changes in knowledge and attitudes immediately after a course of study and whether this would lead to a concomitant response in terms of registration. Monitoring over a longer period may have resulted in a greater number of participants registering their organs for donation but may have been influenced by other factors. Registration rates of participants before commencing the study were akin to those of the general population[10] suggesting that choice of a caring vocation such as nursing does not necessarily equate with a greater degree of altruism with respect to organ donation. This observation that many health care professionals do not always exhibit pro-donation behaviours has been reported previously.[24, 39-44] A considerable proportion of participants indicated that they associated registering as an organ donor with issues of mortality which may help to explain the relatively low level of donation. It has been suggested that the exhibition of unusually high levels of fear or anxiety about death[45-47] can prevent people from associating themselves with a behaviour that serves as a reminder of mortality.[48] It should also be noted that the cohort in this study was relatively young and would be less likely to have encountered life-threatening situations or serious illness. There were too few numbers in the older age groups to assess any trends with age.

The concept of brain death and what constitutes the legal definition of death has been frequently misunderstood by health care professionals.[18, 44, 49-52] The results show that participants understanding of brain death and the likelihood of recovery following a diagnosis of brain death improved significantly upon completion of the study. Although this is a promising result, a small proportion nevertheless continued to raise concerns about their understanding of this important concept. Correctly understanding brain death and the likelihood of recovery is paramount in the organ donation process to ensure that misconceptions are avoided and that relatives of the deceased can make confident and well informed end-of-life decisions.[34, 53-54]

The results demonstrate that prior to the programme of study, around one third of participants did not understand which organs could be successfully donated after death and this was most pertinent in relation to the donation of corneal tissue – an organ that is not donated to save life but to restore sight. The programme of study improved understanding significantly. Less than a fifth of participants were aware of the many different methods that exist to register organ donation intentions in the UK before the programme and whilst this improved after completion of the course, less than half of the cohort (42.0%) exhibited sufficient knowledge in this area. The increase in knowledge may have had an effect on attitude, as after the programme of study a greater number of participants were unwilling to support changes to legislation and favoured the current system of informed consent. This notwithstanding, the majority (64.0%) supported changes to the organ donation system in the UK.

The majority of participants in this study disapproved of a rewards scheme and this did not alter after the course of study. This has been reported previously[23] and is thought to be because it appears to undermine the individual and cast doubt over their intentions to donate.[55]

As this study utilised a convenience sample to recruit participants from a single institution, the findings cannot be generalised to other nursing students from the UK. Further research from different parts of the county is needed to compare findings and to determine whether willingness to donate translates to improved attitudes to organ donation and ultimately to effective procurement.

Conclusion

A short course of study can effectively increase knowledge of and change in attitude and behaviour with respect to organ donation. Significant changes in attitude and behaviour were an increased willingness to discuss organ donation intentions with relatives and decreased support for changing the current system of informed consent. The effect of education, whether concentrated and provided over a shorter period or given as a smaller components of a course that regularly emphasises various aspects of organ donation and procurement needs to be tested with different cohorts from various parts of the UK to see whether providing appropriate education to those who will be involved in procuring organs for transplantation can influence the number and types of organs that are donated.

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Competing interests

“All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that all authors had: (1) No financial support for the submitted work from anyone other than their employer; (2) No financial relationships with commercial entities that might have an interest in the submitted work; (3) No spouses, partners, or children with relationships with commercial entities that might have an interest in the submitted work; (4) No Non-financial interests that may be relevant to the submitted work.”

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Provenance/Contributorship: Barbara Pierscionek is a Professor of Vision Science and Associate Dean (Research and Enterprise) for the Faculty of Science, Engineering and Computing at Kingston University London. She is qualified in science and law, has taught ethics and law and researches the biology and physics of ageing as well as healthcare ethics and presumed consent. Dr Donal McGlade is clinically qualified and completed a PhD on attitudes that determine behaviour with respect to organ donation. He is currently a Postdoctoral Research Associate at Kingston University London.

Conceived and designed the experiments: DM BP. Performed the experiments: DM. Analyzed the data: DM BP. Contributed materials/analysis tools: DM BP. Wrote the paper: DM BP. Guarantor: BP.

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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	N/A
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	N/A
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	N/A
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	N/A
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6-8
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6-8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	N/A
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	N/A

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	10
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	10
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	N/A
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10-13
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	10-13
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	13-16
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	16
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	16-17
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	17

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

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Can education alter attitudes, behaviour and knowledge about organ donation? A pre-test post-test study

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Can education alter attitudes, behaviour and knowledge about organ donation? A pre-test post-test study

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Key words: organ donation, attitudes, knowledge, education

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Abstract

Objective: The emergence of evidence suggests that student nurses commonly exhibit concerns about their lack of knowledge of organ donation and transplantation. Formal training about organ donation has been shown to positively influence attitude, encourage communication and registration behaviours and improve knowledge about donor eligibility and brain death. The focus of this study is to determine the attitude and behaviour of student nurses and to assess their level of knowledge about organ donation after a programme of study.

Design: A quantitative questionnaire was completed before and after participation in a programme of study using a pretest-posttest design.

Setting: Participants were recruited from a University based in Northern Ireland during the period of February to April 2011.

Participants: 100 pre-registration nurses (female:male = 96:4) aged 18 to 50 years (mean [SD] 24.3 [6.0] years) were recruited.

Results: Participants' knowledge improved over the programme of study with regards to the suitability of organs that can be donated after death, methods available to register organ donation intentions, organ donation laws, concept of brain death and the likelihood of recovery after brain death. Changes in attitude post intervention were also observed in relation to participants' willingness to accept an informed system of consent and with regard to participants' actual discussion behaviour.

Conclusions: The results provide support for the introduction of a programme that helps inform and guide student nurses about important aspects of organ donation.

Article focus:

- To determine the attitude of student nurses towards organ donation
- To determine student nurses knowledge
- To determine student nurses behaviour with regard to organ donation registration and discussion

Key messages:

- Participants' knowledge significantly improved with regard to organ suitability, registration methods, legislation, brain death and likelihood of recovery
- Participants' organ donation discussion behaviour was positively influenced by their involvement in the programme
- The programme was successful in helping demonstrate the importance of providing formal instruction about organ donation and transplantation.

Strengths and limitations:

- The strengths of this article are its novelty, as this is the first UK-based study that highlights the importance of formal instruction and demonstrates the merits of knowledge-gains in key areas related to organ donation and transplantation and the need for effective communication with family members
- The limitations of this article are that findings were based on perceived knowledge rather than on actual knowledge and the use of self-reported measures to determine change in attitude and behaviour. It is based on a single cohort of student nurses.

Background

Organ donation is a unique social activity that has a direct influence on the delivery of health care to a wide range of patients. Transplantation and its known therapeutic benefits are not possible without the cooperation and support of healthcare professionals, government and society as a whole. Transplantation is the treatment of choice that improves life expectancy and quality of life [1-2]. In addition, transplantation contributes to reducing healthcare expenditure [2-7]. The donation and transplantation system represents a complex practice [8] and is dependent on individual attitudes, social structures, cultural practices and religious beliefs. It is known that approximately 90% of the general public have a favourable view of organ donation [9]. However, nurses have reported difficulties in being able to broach the subject of organ donation [10-11] and as a consequence less than 55% of those likely to donate will be in a position to ultimately provide consent for donation.[12] These inconsistencies serve to demonstrate that successful organ procurement fundamentally requires action on the part of the healthcare professional. Therefore, the attitude and approach of those healthcare professionals who procure organs for transplantation should not be dismissed as inconsequential. Nurses represent the largest group of such professionals [13] and are the critical link within the transplantation system [14]. Although it is recognised that not all nurses would be in a position to initiate the organ donation process, evidence suggests that nurses recognise that they have a crucial role to play in helping to support the process of organ donation and transplantation and in helping to raise its profile amongst the public [15-16].

The emergence of evidence tends to suggest that nurses commonly exhibit concerns about their lack of knowledge and experience in dealing adequately with all aspects of organ donation and transplantation [10-11, 17-24]. It has also been found that medical students possess limited knowledge about organ donation [25-27]. This likely to be because of the way in which organ donation and transplantation training is being delivered in a non-systematic manner from within other subjects [28]. It has been noted that student nurses based in the USA frequently misunderstand the concept of brain death [29] and that important issues related to brain death and cardiac death continue to be neglected [28]. It has also been shown that there is a paucity of knowledge about how to initiate discussion about organ donation [28]. This limited grasp of fundamental elements of the organ donation process is a reflection on the amount of time that is dedicated towards organ donation and transplantation within core curricula of medical and nursing courses [28].

It has been acknowledged that formal training about organ donation can successfully influence student nurses' attitudes, encourage communication and registration behaviours and help improve knowledge about donor eligibility and brain death[30-32]. Further improving knowledge about the organs suitable for donation, the methods available for registration and the regulations that govern the process of organ donation in the UK could help remove significant barriers and encourage engagement in pro-social behaviours[33]. It is therefore important to ensure that those who may influence rates of transplantation are prepared and properly informed about the processes involved.

The objective of this study is to examine the attitudes and behaviour of student nurses and to assess their level of knowledge about organ donation before and after a programme of study. It is hypothesized that a programme of study can significantly improve knowledge and positively influence attitude and behaviour towards organ donation.

Methods

Design

A pretest-posttest design was chosen to establish the impact of a programme of study on knowledge, attitude and behaviour involving two sets of cross-sectional data on the same population in order to determine change.

Ethics

Approval was sought and subsequently granted from the institutional review board at the University of Ulster. The researcher (DM) visited the university prior to starting the study so that background information could be provided and to help resolve any queries. Participation in the study was voluntary and without any form of compensation. Informed consent was obtained from all participants.

Setting and participants

Convenience sampling techniques were used to recruit pre-registered nursing students undertaking a full-time degree course leading to the award of BSc. (Hons). A total of 115 second year students were approached during the third trimester of a three year course of education at the University of Ulster, Northern Ireland. This sample was chosen because the population of Northern Ireland is relatively homogenous in terms of ethnicity, religion and socio-economic factors. The cohort had recently completed a considerable proportion of their elective placements in general and specialist hospital care.

Measures

- *The questionnaire*

Participants completed a quantitative questionnaire based on previous validated frameworks [34-38]. The questionnaire was further developed by several academic experts in the areas of biomedical science, mathematics and psychology and was extended to include additional concepts: attitude to registration and donation, knowledge on brain death, financial incentives and legislation. The questionnaire was then tested on a student nursing population in Northern Ireland and took into consideration the appropriateness of the content, use of language and sequence of questions. The questionnaire gathered demographic information on gender, age, country of birth, marital status and religious affiliation. Items in the questionnaire were categorised as two behaviour items, one willingness item, eight attitude items and six knowledge items (Table 1).

Table 1: Questionnaire items

Behaviour

(1) Have you registered to be an organ donor? [34] *(yes/no)*

(2) Have you discussed your organ donation intentions with your family? [34]*(yes/no)*

Willingness

(1) Would you consider becoming an organ donor? *(yes/no/I do not know)*

Attitude

(1) Becoming an organ donor makes me think about my own death?[34] *(strongly agree/agree/disagree/strongly disagree)*

(2) What do you think are the benefits of donation?[34, 38] *(to help improve another person's quality of life/to save another person's life/to help families through the grieving process/it is a good thing for society)*

(3) By signing a donor card, doctors might do something to me before I am really dead?[34, 36] *(strongly agree/agree/disagree/strongly disagree)*

(4) The possible misuse of my organs after death makes me feel less supportive of organ donation?[38] *(strongly agree/agree/disagree/strongly disagree)*

(5) I would support a change to the current organ donation system?[36] *(strongly agree/agree/disagree/ strongly disagree)*

(6) The law should be changed so that everyone is an organ donor unless they say no?[34, 37]*(strongly agree/agree/disagree/strongly disagree)*

(7) The law should be changed so that everyone is encouraged to formalise their donation intentions? *(strongly agree/agree/disagree/strongly disagree)*

(8) The government should provide financial help to those families who donate? *(strongly agree/agree/disagree/strongly disagree)*

Knowledge

(1) Of which method of registration are you aware?[35] *(donor card/national register/driving license/GP surgery/electoral roll/passport/Boots The Chemist)*

(2) Which of the following do you think can be donated after death?[38] *(eyes/heart/kidneys/liver/lungs)*

(3) Does your religion allow organ donation?[34, 38] *(yes/no/I do not know)*

(4) Are you aware of any laws that control organ donation?[38] *(yes/no/I do not know)*

(5) Would you consider a person who is declared brain dead but still has a beating heart as being dead?[36] *(yes/no/I do not know)*

(6) How likely do you think it is that a brain dead person with a beating heart might recover and live?[34] *(very likely/likely/unlikely/very unlikely)*

- *The programme of study*

Participants completed a 33-hour programme of study within the degree course that incorporated important issues relating to the clinical care of the potential organ donor as well as from the perspective of the transplant patient. The programme was designed to place an emphasis on the following areas: criteria for organ donation and what organs can be donated, nursing the potential organ donor and transplant patient and areas of potential risk, procedures involved in neurological assessment and management of brain injury, medical diagnosis of brain death, the legally accepted definition that leads to certification of death, effective communication strategies with donors and their relatives as well as recipients and their relatives, processes involved in procurement of organs and ethical aspects of organ donation and transplantation such as reasons for consent, respect for autonomy, beneficence and confidentiality. The importance of discussing intention to donate with family members was also covered. The programme of study was delivered to participants in a classroom setting with the whole student cohort gathered at the same time.

Data collection and analysis

Data was collected within an hour of commencement of the programme of study (February 2011) and after completion of the programme of study (April 2011). To determine whether the sample size chosen was adequate, a post-hoc power analysis was conducted. The Exact tests option was chosen from the test family and two dependent groups (McNemar) selected as the statistical test in G*Power Version 3.17. The power analysis demonstrated that the sample size (n = 100) had an acceptable level of power (0.89) and was deemed adequate for the analysis [39].

Descriptive statistics were used to assess demographic information, with the McNemar test chosen as the most appropriate tool for analysing dichotomous items from matched pairs of participants [40] using the Statistical Package for Social Sciences Version 19. It was decided that Yates' correction for continuity should not be applied within a two by two contingency table. This is based on evidence suggesting that the corrected Chi-square statistic is overly conservative and that the conventional statistic will provide adequate control over Type I errors [41-42]. A significant McNemar χ^2 is an indication of a change between baseline and follow-up measurement.

Results

Initially, 109 participants completed a questionnaire at baseline. Of these participants, 100 (91.7%) also completed a follow-up questionnaire; 9 (8.3%) failed to do so and were subsequently excluded from any further analysis. Therefore, the final response rate achieved was 87.0%.

Of the participants who completed both questionnaires, 96 (96.0%) were female and this reflects the gender base of the profession [43]. Ages ranged from 18 to 50 years (mean [SD] 24.3 [6.0] years). The majority of participants (n = 82, 82.0%) were in their third decade, 5 (5.0%) in their second decade, 10 (10.0%) in their fourth decade, 1 (1.0%) in their fifth decade and 2 (2.0%) in their sixth decade. All participants reported religious (Christian) beliefs.

Knowledge about organ donation

Responses obtained from participants demonstrated significant changes in several key areas as seen in Table 2. Knowledge about the suitability of organs that can be donated after death improved considerably (McNemar χ^2 = 23.059, exact p <0.001) with 28.0% more participants able to correctly identify which organs are suitable for donation at follow-up compared to baseline measurement (95% CI = 17.5 to 38.1). In particular, there was an improvement of knowledge in relation to the donation of corneal tissue: 96.0% of participants correctly understood at follow-up that the cornea is a tissue that can be successfully donated after death, compared with 72.0% at baseline (McNemar χ^2 = 19.200, exact p <0.001; 95% CI = 15.3 to 32.4). There was an increase of 24.0% in the number of participants who understood the methods available to register organ donation intentions subsequent to baseline measurement (McNemar χ^2 = 24.000, exact p <0.001; 95% CI = 15.3 to 32.4).

Following completion of the study, there was a rise in the number of participants who understood the laws relating to organ donation (McNemar χ^2 = 11.636, exact p = 0.001; 95% CI = 7.0 to 25.3) and a statistically significant improvement in knowledge about brain death (McNemar χ^2 = 11.560, exact p = 0.001; 95% CI = 7.5 to 26.4) and the likelihood of recovery following a diagnosis of brain death (McNemar χ^2 = 5.538, exact p = 0.019; 95% CI = 1.9 to 22.0) (Table 2). However, 11.0% of the cohort continued to express doubts about this matter and believed that a person declared brain dead might subsequently recover and lead a normal life.

Table 2: Knowledge about organ donation

	Total sample, n (%)		
% of participants:	**Pretest**	**Posttest**	**p-value**
(1) who answered correctly the methods for organ donor registration	18 (18.0)	42 (42.0)	<0.001
(2) who answered correctly the organs that can be donated after death	67 (67.0)	95 (95.0)	<0.001
(3) who answered correctly that their religion allows organ donation	82 (82.0)	88 (88.0)	0.157
(4) aware of laws that control organ donation	5 (5.0)	21 (21.0)	0.001
(5) who answered correctly that a person declared brain dead is legally dead	14 (14.0)	31 (31.0)	0.001
(6) who answered correctly that a brain dead person is unlikely to recover and live	77 (77.0)	89 (89.0)	0.019

No statistically significant change was found with regard to religion and its supporting role in organ donation (McNemar χ^2 = 2.000, exact p = 0.157) (Table 2). Responses also did not differ on the basis of willingness to register as an organ donor.

Willingness and behaviour toward to organ donation

The number of participant's willing to register as an organ donor demonstrated a 14.3% rise (Baseline: 35 willing, 13 unwilling, 22 unsure; Follow-up: 45 willing, 7 unwilling, 18 unsure). Participants also reported a 5.0% rise in the number currently registered (Baseline: 33 willing, 67 unwilling; Follow-up: 38 willing, 62 unwilling). However, the observed increases were not considered to be statistically significant in either case. At follow-up, a greater number of participants (14.0%; 95% CI = 6.9 to 20.8) indicated that they had discussed their organ donation intentions with their family or friends compared to baseline measurement (McNemar χ^2 = 14.000, exact p <0.001) (Table 3).

Table 3: Willingness and behaviour toward organ donation

	Total sample, n (%)		
% of participants…	**Pretest**	**Posttest**	**p-value**
(1) registered to be an organ donor	33 (33.0)	38 (38.0)	0.132
(2) considering becoming an organ donor	35 (35.0)	45 (45.0)	0.086
(3) that discussed donation with their family	39 (39.0)	53 (53.0)	<0.001

Attitude toward organ donation

A greater number of participants (16.0%; 95% CI = 4.7 to 26.8) favoured an informed system of consent at follow-up rather than opting for a change in legislation (McNemar χ^2 = 7.529, exact p = 0.006) (Table 4). The results indicate that the majority of participants at both baseline (72.0%) and follow-up (70.0%) associated the process of registering as an organ donor with recognition of their own mortality and that support for the introduction of a government incentive scheme was low (Baseline: 28.0%; Follow-up: 27.0%) (Table 4). No statistically significant change was found with regard to: perceived benefits of organ donation (McNemar χ^2 = 2.000, exact p = 0.157); medical distrust (McNemar χ^2 = 0.000, exact p = 1.000); and misappropriation of donated organs (McNemar χ^2 = 0.100, exact p = 0.752) (Table 4). The responses did not differ on the basis of willingness to register as an organ donor.

Table 4: Attitude toward organ donation

	Total sample, n (%)		
% of participants:	**Pretest**	**Posttest**	**p-value**
(1) who thought that organ donation makes them think about their own death	72 (72.0)	70 (70.0)	0.695
(2) who answered correctly the benefits of donation	87 (87.0)	93 (93.0)	0.157
(3) who thought that by signing a donor card, doctors might do something to them before they were really dead	17 (17.0)	17 (17.0)	0.100
(4) who felt less supportive of organ donation because their organs might be misused	53 (53.0)	51 (51.0)	0.752
(5) who would support a change to the current organ donation system	80 (80.0)	64 (64.0)	0.006
(6) who thought the law should be changed so everyone is a donor unless they say no	43 (43.0)	48 (48.0)	0.336
(7) who thought the law should be changed so everyone is encouraged to formalise their donation intentions	79 (79.0)	74 (74.0)	0.369
(8) who thought the government should provide financial help to families who donate	28 (28.0)	27 (27.0)	0.835

Discussion

The results from this study support the conclusions of previous work that student nurses' knowledge of organ donation can be substantially improved and that their discussion behaviours could be positively influenced by education about the topic [30-32]. Statistically significant changes in knowledge about fundamental aspects of organ donation occurred in relation to: the suitability of organs that could be donated after death, methods available to register organ donation intentions, organ donation laws and the likelihood of recovery following a diagnosis of brain death. Particularly notable were the improvements in understanding the fundamental medico-legal issues, namely how the law operates with regard to donation and the difference between informed and presumed consent and the fact that brain death is legally certifiable cause of death. In addition, a programme of study specifically focussed on organ donation, appears to have had an effect on stimulating discussion about the prospect of donating organs and this must necessarily involve some thought about personal perspectives. Previous studies [30-32] have suggested that education plays an important role in helping to influence attitude. It was notable, in this study that posttest, the only significant change in attitude was a decrease in the number of participants who favoured a change in the law from the current system of informed consent to one of presumed consent.

There was an increase in awareness of the benefits of organ donation but this was not significant as a high proportion of participants at baseline (87%) expressed such awareness. There was very little change, if any, with regard to associating organ donation with a hastened death (Attitude 3, Table 4), fear of organ misuse (Attitude 4, Table 4) or opinion about financial assistance (Attitude 8, Table 4).

Education about organ donation is not routinely incorporated into nursing degree curricula [28]. A course of study needs to be objective and sufficiently informative to encourage independent thought that will lead to measured decisions to donate and can be conveyed with justification to relatives. Spain is a country that relies upon the

"Spanish Model of Organ Donation and Transplantation" and has been accredited with the highest rate of deceased organ donation for a whole country [44]. This model provides education to healthcare professionals, helping them to engage fully with organ donation and transplantation and has directly resulted in a continuous rise in the number of families willing to provide consent to donation [45].

It needs to be recognised that whilst the individual decision whether or not to donate should be paramount, in many cases the final decision rests with relatives. Indeed, the most common reason for lack of organ donation is a failure to obtain consent from relatives of the potential donor [46]. This is attributed to families not being made fully aware of the prior wishes of the deceased [47-49]. Communicating an intention to donate to family members is frequently omitted [50-51]. This may be the reason that over half of all families approached for organ donation in the UK typically refuse to provide consent [12]. The importance of effective communication was addressed in this programme of study, with results indicating that participants were more likely to engage in discussion about organ donation with family members after the programme was completed. The programme may have directly motivated such discussions or it could be that other emotive aspects, encountered during the course of study, may have prompted such discourse.

This study has shown that even within a small group, after a programme of study, the understanding about organ donation and the processes involved can be significantly improved, leading to consideration about donation of organs and decisions with relatives. This study aimed to capture any changes in knowledge and attitudes immediately after a programme of study and to determine whether there would be a concomitant response in organ donation registration and discussion behaviours. Registration rates of participants before commencing the study were akin to those of the general population [12] suggesting that choice of a caring vocation such as nursing does not necessarily equate with a greater degree of altruism with respect to organ donation. This observation that many healthcare professionals do not always exhibit pro-donation behaviours has been reported previously.[17-24] A considerable proportion of participants indicated that they associated registering as an organ donor with issues of mortality and this may help explain the relatively low level of donation. It has been suggested that the exhibition of unusually high levels of fear or anxiety about death [52-54] can prevent people from associating themselves with a behaviour that requires them to consider their own mortality [55]. It should also be noted that the cohort in this study was relatively young and would be less likely to have encountered life-threatening situations or serious illness. There were too few numbers in the older age groups to assess any trends with age.

The concept of brain death and what constitutes the legal definition of death has been frequently misunderstood by health care professionals [11, 17, 19- 22]. The results show that participants' understanding of brain death and the likelihood of recovery following a diagnosis of brain death improved significantly upon completion of the study. Although this is a promising result, a small proportion nevertheless continued to raise concerns about their understanding of this important concept. Correctly understanding brain death and the likelihood of recovery is paramount in the organ donation process to ensure that misconceptions are avoided and that relatives of the deceased can be properly informed to make confident end-of-life decisions [47, 56-57].

The results demonstrate that prior to the programme of study, around one-third of participants did not understand which organs could be successfully donated after death and this was most pertinent in relation to the donation of corneal tissue – an organ that is not donated to save life but to restore sight. The programme of study improved understanding significantly. Less than a fifth of participants were aware of the many different methods that exist to register organ donation intentions in the UK before the programme; whilst this improved after completion of the programme, less than half of the cohort (42.0%) exhibited sufficient knowledge in this area. The increase in knowledge may have had an effect on attitude, as after the programme of study a greater number of participants were unwilling to support changes to legislation and favoured the current system of informed consent. This notwithstanding, the majority (64.0%) supported changes to the organ donation system in the UK.

The majority of participants in this study disapproved of a financially incentivised rewards scheme and this did not alter after the programme of study. This effect has been reported previously [35] and is thought to be because it appears to undermine the individual and cast doubt over their intentions to donate [58].

This study used a pretest posttest design. The limitations of such a design are that the pretest may sensitise participants to what is being investigated and thereby affect posttest results. In this research, the intervention was a programme of study aimed at informing and teaching participants and hence the posttest was to determine what had been learned and understood and how this may alter attitudes and behaviour. Given that participants will have been aware that they would be asked to complete a questionnaire after the programme of study, they may have paid more attention to the course content, than they otherwise would have done. The short duration between the intervention and the pre and post testing, minimised the effects of any external factors that could have occurred between testing and the programme. However, as the programme took place over a period of two months, there may have been influences from media or other social or community sources that participants encountered between lectures and that had some effect on the posttest results.

More insight into the benefits of such courses will be gained by investigating a wider diversity of cohorts and trialling longer courses of study so that participants have a longer period of time to consider whether to register for organ donation. As this study utilised a convenience sample to recruit participants from a single institution, the findings cannot be generalised to other nursing students from the UK. Further research from different parts of the country is needed to compare findings and to determine whether willingness to donate translates to improved attitudes to procuring organs for donation.

Conclusion

A short programme of study can effectively improve student nurses' knowledge of organ donation and positively influence their ability to discuss organ donation intentions with their family. The effect of education, whether concentrated and provided over a shorter period or given as a smaller component of a course emphasising various aspects of organ donation and procurement, needs to be tested with different cohorts from various parts of the UK. This will help determine whether providing appropriate education to those who will be involved in procuring organs for transplantation can influence the number and types of organs that are donated.

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Competing interests

“All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that all authors had: (1) No financial support for the submitted work from anyone other than their employer; (2) No financial relationships with commercial entities that might have an interest in the submitted work; (3) No spouses, partners, or children with relationships with commercial entities that might have an interest in the submitted work; (4) No Non-financial interests that may be relevant to the submitted work.”

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Author contribution

Conceived and designed the experiments: DM BP. Performed the experiments: DM. Analyzed the data: DM BP. Contributed materials/analysis tools: DM BP. Wrote the paper: DM BP. Guarantor: BP.

Data sharing

There are no additional unpublished data from this study.

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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	N/A
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	N/A
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	N/A
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	N/A
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6-8
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6-8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	N/A
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	N/A

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	10
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	10
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	N/A
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10-13
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	10-13
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	13-16
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	16
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	16-17
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	17

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

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Can education alter attitudes, behaviour and knowledge about organ donation? A pre-test post-test study

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Abstract

Objective: The emergence of evidence suggests that student nurses commonly exhibit concerns about their lack of knowledge of organ donation and transplantation. Formal training about organ donation has been shown to positively influence attitude, encourage communication and registration behaviours and improve knowledge about donor eligibility and brain death. ~~and ability to participate in the organ donation system~~. The focus of this study is to determine the attitude and behaviour of student nurses and to assess their level of knowledge about organ donation after a programme of study.

Design: A quantitative questionnaire was completed before and after participation in a programme of study ~~Questionnaire-based study~~ using a pretest-posttest design.

Setting: Participants were recruited from a university based in Northern Ireland during the period of February to April 2011.

Participants: 100 pre-registration nurses (female:male = 96:4) aged 18 to 50 years (mean [SD] 24.3 [6.0] years) were recruited.

Results: Participants' knowledge improved over the programme of study with regards to the suitability of organs that can be donated after death, methods available to register organ donation intentions, organ donation laws, concept of brain death and the likelihood of recovery after brain death. Changes in attitude post intervention were also observed in relation to participants' willingness to ~~discuss organ donation intentions and~~ accept an informed system of consent and with regard to participants' actual discussion behaviour. ~~improved support for a system of informed consent.~~

Conclusions: The results provide support for the introduction of a programme that helps inform and guide student nurses about important aspects of organ donation.

Article focus:

- To determine the attitude of student nurses towards organ donation
- To determine student nurses knowledge
- To determine student nurses behaviour with regard to organ donation registration and discussion

Key messages:

- Participants' knowledge significantly improved ~~in several key areas~~ with regard to organ suitability, registration methods, legislation, brain death and likelihood of recovery
- Participants' organ donation discussion behaviour ~~attitude~~ was positively influenced by their involvement in the programme
- The programme was successful in helping demonstrate the importance of providing formal instruction about organ donation and transplantation.

Strengths and limitations:

- The strengths of this article are its novelty, as this is the first UK-based study that highlights the importance of formal instruction and demonstrates the merits of knowledge-gains in key areas related to organ donation and transplantation and the need for effective communication with family members
- The limitations of this article are that findings were based on perceived knowledge rather than actual knowledge and the use of self-reported measures to determine change in attitude and behaviour. It is based on a single cohort of student nurses.

Background

Organ donation is a unique social activity that has a direct influence on the delivery of health care to a wide range of patients. Transplantation and its known therapeutic benefits are not possible without the cooperation and support of healthcare professionals, government and society as a whole. Transplantation is the treatment of choice that improves life expectancy and quality of life.[1-2] In addition, transplantation contributes in reducing healthcare expenditure.[2-7] The donation and transplantation system represents a complex practice[8] and is dependent on individual attitudes, social structures, cultural practices and religious beliefs. It is known that ~~Although~~ approximately 90% of the general public have a favourable view of organ donation.[9] However, nurses have reported difficulties in being able to broach the subject of organ donation [10-11] and as a consequence less than 55% of those likely to donate will be in a position to ~~potential donors' relatives~~ ultimately provide consent for donation.[12] These inconsistencies serve to demonstrate that successful organ procurement fundamentally requires action on the part of the healthcare professional. Therefore, the attitude and approach of those healthcare professionals who procure organs for transplantation should not be dismissed as inconsequential. Nurses represent the largest group of such professionals[13] and are the critical link within the transplantation system.[14] Although it is recognised that not all nurses would be in a position to initiate the organ donation process, evidence suggests that nurses recognise that they have a crucial role to play in helping to support the process of organ donation and transplantation and in helping to raise its profile amongst the public.[15-16]

The emergence of evidence tends to suggest that ~~student~~ nurses commonly exhibit concerns about their lack of knowledge and experience in dealing adequately with all aspects of organ donation and transplantation.[10-11, 17-24] It has also been found that medical students possess limited knowledge about organ donation.[25-27] This is likely to be because of the way in which organ donation and transplantation training is being delivered in a non-systematic manner from within other subjects.[28] It has been noted that student nurses based in the USA frequently misunderstand the concept of brain death[29] and that important issues related to brain death and cardiac death continue to be neglected.[28] It has also been shown that there is a paucity of knowledge about how to initiate discussion about organ donation [28]. This limited grasp of fundamental elements of the organ donation process is a reflection on the amount of time that is dedicated towards organ donation and transplantation within core curricula of medical and nursing courses.[28]

It has been acknowledged that formal training about organ donation can successfully ~~impact upon~~ influence student nurses' attitude, encourage communication and registration behaviours and help improve knowledge about donor eligibility and brain death.[30-32] Further improving knowledge about the organs suitable for donation, the methods available for registration and the regulations that govern the process of organ donation in the UK could help remove significant barriers and encourage engagement in pro-social behaviours.[33] It is therefore important to ensure that those who may influence rates of transplantation are prepared and properly informed about the processes involved.

The objective of this study is to examine ~~knowledge and~~ the attitudes and behaviours of student nurses and to assess their level of knowledge about organ donation before and after a programme of study. ~~in order to assess whether this may result in changes that could lead to improved organ donation rates.~~ It is hypothesized that a programme of study can significantly improve knowledge and positively influence attitude and behaviour towards organ donation.

Methods

Design

A pretest-posttest design was chosen to establish ~~the exhibition of pro-donation behaviours and~~ the impact of a programme of study on knowledge, attitude and behaviour ~~with regard to attitude~~ involving two sets of cross-sectional data on the same population in order to determine change.

Ethics

Approval was sought and subsequently granted from the institutional review board at the University of Ulster. The researcher (DM) visited the university prior to starting the study so that background information could be provided and to help resolve any queries. Participation in the study was voluntary and without any form of compensation. Informed consent was obtained from all participants.

Setting and participants

Convenience sampling techniques were used to recruit pre-registered nursing students undertaking a full-time degree course leading to the award of BSc. (Hons). A total of 115 second year students were approached during the third trimester of a three year course of education at the University of Ulster, Northern Ireland. This sample was chosen because the population of Northern Ireland is relatively homogenous in terms of ethnicity, religion and socio-economic factors. The cohort had recently completed a considerable proportion of their elective placements in general and specialist hospital care.

Measures

- *The questionnaire*

Participants completed a quantitative questionnaire based on previous validated frameworks.[34-38] The questionnaire was further developed by several academic experts in the areas of biomedical science, mathematics and psychology and was extended to include additional concepts: attitude to registration and donation; knowledge on brain death; financial incentives and legislation. The questionnaire was then tested on a student nursing population in Northern Ireland and took into consideration the appropriateness of the content, use of language and sequence of questions. ~~Validation of the questionnaire content was undertaken by several academic experts.~~ The questionnaire gathered demographic information on gender, age, country of birth, marital status and religious affiliation. Items in the questionnaire were categorised as two behaviour items, one willingness item, eight attitude items and six knowledge items (Table 1). ~~Knowledge of the organ donation process was measured using nine items and attitude was assessed with eight items (Table 1).~~

Table 1: Questionnaire items

Behaviour

(1) Have you registered to be an organ donor? [34] *(yes/no)*

(2) Have you discussed your organ donation intentions with your family? [34]*(yes/no)*

Willingness

(1) Would you consider becoming an organ donor? *(yes/no/I do not know)*

Attitude

~~Have you registered to be an organ donor? (yes/no)~~

~~Would you consider becoming an organ donor? (yes/no/I do not know)~~

~~Have you discussed your organ donation intentions with your family? (yes/no)~~

(1) Becoming an organ donor makes me think about my own death?[34] *(strongly agree/agree/disagree/strongly disagree)*

(2) What do you think are the benefits of donation?[34, 38] *(to help improve another person's quality of life/to save another person's life/to help families through the grieving process/it is a good thing for society)*

(3) By signing a donor card, doctors might do something to me before I am really dead?[34, 36] *(strongly agree/agree/disagree/strongly disagree)*

(4) The possible misuse of my organs after death makes me feel less supportive of organ donation?[38] *(strongly agree/agree/disagree/strongly disagree)*

(5) I would support a change to the current organ donation system?[36] *(strongly agree/agree/disagree/ strongly disagree)*

(6) The law should be changed so that everyone is an organ donor unless they say no?[34, 37]*(strongly agree/agree/disagree/strongly disagree)*

(7) The law should be changed so that everyone is encouraged to formalise their donation intentions? *(strongly agree/agree/disagree/strongly disagree)*

(8) The government should provide financial help to those families who donate? *(strongly agree/agree/disagree/strongly disagree)*

Knowledge

~~What do you think are the benefits of donation?[31] (to help improve another person's quality of life/to save another person's life/to help families through the grieving process/it is a good thing for society)~~

~~By signing a donor card, doctors might do something to me before I am really dead?[29] (strongly agree/agree/disagree/strongly disagree)~~

~~The possible misuse of my organs after death makes me feel less supportive of~~

~~organ donation?[31] (strongly agree/agree/disagree/strongly disagree)~~

(1) Of which method of registration are you aware?[35] *(donor card/national register/driving license/GP surgery/electoral roll/passport/Boots The Chemist)*

(2) Which of the following do you think can be donated after death?[38] *(eyes/heart/kidneys/liver/lungs)*

(3) Does your religion allow organ donation?[34, 38] *(yes/no/I do not know)*

(4) Are you aware of any laws that control organ donation?[38] *(yes/no/I do not know)*

(5) Would you consider a person who is declared brain dead but still has a beating heart as being dead?[36] *(yes/no/I do not know)*

(6) How likely do you think it is that a brain dead person with a beating heart might recover and live?[34] *(very likely/likely/unlikely/very unlikely)*

- *The programme of study*

~~The programme of study was delivered during a 33-hour module within the degree course that encouraged participants to interact and engage in discussion wherever possible.~~ Participants completed a 33-hour programme of study within the degree course that ~~The material was designed to~~ incorporated important issues relating to the clinical care of the potential organ donor as well as from the perspective of the transplant patient. The programme was designed to place ~~placed~~ an emphasis on the following areas: criteria for organ donation and what organs can be donated, nursing the potential organ donor and transplant patient and areas of potential risk, procedures involved in neurological assessment and management of brain injury, medical diagnosis of brain death, the legally accepted definition that leads to certification of death, effective communication strategies with donors and their relatives, recipients and their relatives and other professionals, processes involved in procurement of organs and ethical aspects of organ donation and transplantation such as reasons for consent, respect for autonomy, beneficence and confidentiality. The importance of discussing intention to donate with family members was also covered. The programme of study was delivered to participants in a classroom setting with the whole student cohort gathered at the same time.

Data collection and analysis

Data was collected within an hour of commencement of the programme of study ~~immediately~~ (February 2011) and after completion of the programme of study ~~module~~ (April 2011). To determine whether the sample size chosen was adequate, a post-hoc power analysis was conducted. The Exact tests option was chosen from the test family and two dependent groups (McNemar) selected as the statistical test in G*Power Version 3.17. The power analysis demonstrated that the sample size (n = 100) had an acceptable level of power (0.89) and was deemed adequate for the analysis.[39]

Descriptive statistics were used to assess demographic information, with the McNemar test chosen as the most appropriate tool for analysing dichotomous items from matched pairs of participants[40] using the Statistical Package for Social Sciences Version 19. It was decided that Yates' correction for continuity should not be applied within a two by two contingency table. This is based on evidence suggesting that the corrected Chi-square statistic is overly conservative and that the conventional statistic will provide adequate control over Type I errors.[41-42] A significant McNemar χ^2 is an indication of a change ~~in knowledge or attitude~~ between baseline and follow-up measurement.

Results

Initially, 109 participants completed a questionnaire at baseline. Of these participants, 100 (91.7%) also completed a follow-up questionnaire; 9 (8.3%) failed to do so and were subsequently excluded from any further analysis. Therefore, the final response rate achieved was 87.0%.

Of the participants who completed both questionnaires, 96 (96.0%) were female and this reflects the gender base of the profession.[43] Ages ranged from 18 to 50 years (mean [SD] 24.3 [6.0] years). The majority of participants (n = 82, 82.0%) were in their third decade, 5 (5.0%) in their second decade, 10 (10.0%) in their fourth decade, 1 (1.0%) in their fifth decade and 2 (2.0%) in their sixth decade. All participants reported religious (Christian) beliefs.

Knowledge about organ donation

Responses obtained from participants demonstrated significant changes in several key areas as seen in Table 2. Knowledge about the suitability of organs that can be donated after death improved considerably (McNemar χ^2 = 23.059, exact p <0.001) with 28.0% more participants able to correctly identify which organs are suitable for donation at follow-up compared to baseline measurement (95% CI = 17.5 to 38.1). In particular, there was an improvement of knowledge in relation to the donation of corneal tissue: 96.0% of participants correctly understood at follow-up that the cornea is a tissue that can be successfully donated after death, compared with 72.0% at baseline (McNemar χ^2 = 19.200, exact p <0.001; 95% CI = 15.3 to 32.4). There was an increase of 24.0% in the number of participants who understood the methods available to register organ donation intentions subsequent to baseline measurement (McNemar χ^2 = 24.000, exact p <0.001; 95% CI = 15.3 to 32.4).

Following completion of the study, there was a rise in the number of participants who understood the laws relating to organ donation (McNemar χ^2 = 11.636, exact p = 0.001; 95% CI = 7.0 to 25.3) and a statistically significant improvement in knowledge about brain death (McNemar χ^2 = 11.560, exact p = 0.001; 95% CI = 7.5 to 26.4) and the likelihood of recovery following a diagnosis of brain death (McNemar χ^2 = 5.538, exact p = 0.019; 95% CI = 1.9 to 22.0) (Table 2). However, 11.0% of the cohort continued to express doubts about this matter and believed that a person declared brain dead might subsequently recover and lead a normal life.

Table 2: Knowledge about organ donation

	Total sample, n (%)		
% of participants:	**Pretest**	**Posttest**	**p-value**
(1) who answered correctly the methods for organ donor registration	18 (18.0)	42 (42.0)	<0.001
(2) who answered correctly the organs that can be donated after death	67 (67.0)	95 (95.0)	<0.001
(3) who answered correctly that their religion allows organ donation	82 (82.0)	88 (88.0)	0.157
(4) aware of laws that control organ donation	5 (5.0)	21 (21.0)	0.001
(5) who answered correctly that a person declared brain dead is legally dead	14 (14.0)	31 (31.0)	0.001
(6) who answered correctly that a brain dead person is unlikely to recover and live	77 (77.0)	89 (89.0)	0.019
~~Benefits of organ donation~~	~~87 (87.0)~~	~~93 (93.0)~~	~~0.157~~
~~Medical distrust~~	~~17 (17.0)~~	~~17 (17.0)~~	~~0.100~~
~~Misappropriation of organs~~	~~53 (53.0)~~	~~51 (51.0)~~	~~0.752~~

No statistically significant change was found with regard to religion and its supporting role in organ donation (McNemar χ^2 = 2.000, exact p = 0.157) (Table 2). Responses also did not differ on the basis of willingness to register as an organ donor. ~~perceived benefits of organ donation (McNemar χ^2 = 2.000, exact p = 0.157); medical distrust (McNemar χ^2 = 0.000, exact p = 1.000); and misappropriation of donated organs (McNemar χ^2 = 0.100, exact p = 0.752) (Table 2).~~

Willingness and behaviour toward to organ donation

The number of participant's willing to register as an organ donor demonstrated a 14.3% rise (Baseline: 35 willing, 13 unwilling, 22 unsure; Follow-up: 45 willing, 7 unwilling, 18 unsure). Participants also reported a 5.0% rise in the number currently registered (Baseline: 33 willing, 67 unwilling; Follow-up: 38 willing, 62 unwilling). However, the observed increases were not considered to be statistically significant in either case. ~~There was a small, non-significant increase in the number of participants who indicated that they had a greater intention to register as an organ donor (14.3% rise from baseline measurement) and in participants who reported being currently registered (5.0% rise from baseline measurement).~~ At follow-up, a greater number of participants (14.0%; 95% CI = 6.9 to 20.8) indicated that they had discussed their organ donation intentions with their family or friends compared to baseline measurement (McNemar χ^2 = 14.000, exact p <0.001) (Table 3).

Table 3: Willingness and behaviour toward organ donation

	Total sample, n (%)		
% of participants…	**Pretest**	**Posttest**	**p-value**
(1) registered to be an organ donor	33 (33.0)	38 (38.0)	0.132
(2) considering becoming an organ donor	35 (35.0)	45 (45.0)	0.086
(3) that discussed donation with their family	39 (39.0)	53 (53.0)	<0.001

Attitude toward organ donation

A greater number of participants (16.0%; 95% CI = 4.7 to 26.8) favoured an informed system of consent at follow-up rather than opting for a change in legislation (McNemar χ^2 = 7.529, exact p = 0.006) (Table 4). The results indicate that the majority of participants at both baseline (72.0%) and follow-up (70.0%) associated the process of registering as an organ donor with recognition of their own mortality and that support for the introduction of a government incentive scheme was low (Baseline: 28.0%; Follow-up: 27.0%) (Table 4). No statistically significant change was found with regard to: perceived benefits of organ donation (McNemar χ^2 = 2.000, exact p = 0.157); medical distrust (McNemar χ^2 = 0.000, exact p = 1.000); and misappropriation of donated organs (McNemar χ^2 = 0.100, exact p = 0.752) (Table 4). The responses did not differ on the basis of willingness to register as an organ donor.

Table 4: Attitude toward organ donation

	Total sample, n (%)		
% of participants:	**Pretest**	**Posttest**	**p-value**
(1) who thought that organ donation makes them think about their own death	72 (72.0)	70 (70.0)	0.695
(2) who answered correctly the benefits of donation	87 (87.0)	93 (93.0)	0.157
(3) who thought that by signing a donor card, doctors might do something to them before they were really dead	17 (17.0)	17 (17.0)	0.100
(4) who felt less supportive of organ donation because their organs might be misused	53 (53.0)	51 (51.0)	0.752
(5) who would support a change to the current organ donation system	80 (80.0)	64 (64.0)	0.006
(6) who thought the law should be changed so everyone is a donor unless they say no	43 (43.0)	48 (48.0)	0.336
(7) who thought the law should be changed so everyone is encouraged to formalise their donation intentions	79 (79.0)	74 (74.0)	0.369
(8) who thought the government should provide financial help to families who donate	28 (28.0)	27 (27.0)	0.835

Discussion

The results from this study support the conclusions of previous work that student nurses' knowledge of organ donation can be substantially improved and that their discussion behaviours ~~the opinions and attitudes of student nurses~~ could be positively influenced by education about the topic.[30-32] Statistically significant changes in knowledge about fundamental aspects of organ donation occurred in relation to: the suitability of organs that could be donated after death, methods available to register organ donation intentions, organ donation laws, and the likelihood of recovery following a diagnosis of brain death. Particularly notable were the improvements in understanding the fundamental medico-legal issues, namely how the law operates with regard to donation and the difference between informed and presumed consent and that brain death is a legally certifiable cause of death. In addition, a programme of study specifically focussed on organ donation, appears to have had an effect on stimulating discussion about the prospect of donating organs and this must necessarily involve some thought about personal perspectives. Previous studies [30-32] have suggested that education plays an important role in helping to influence attitude. It was notable, in this study that posttest, the only significant change in attitude was a decrease in the number of participants who favoured a change in the law from the current system of informed consent to one of presumed consent.

There was an increase in awareness of the benefits of organ donation but this was not significant as a high proportion of participants at baseline (87%) expressed such awareness. There was very little change, if any, with regard to associating organ donation with a hastened death (Attitude 3, Table 4), fear of organ misuse (Attitude 4, Table 4) or opinion about financial assistance (Attitude 8, Table 4).

Education about organ donation is not routinely incorporated into nursing degree curricula.[28] A course of study needs to be objective and sufficiently informative to encourage independent thought that will lead to measured decisions to donate and can be conveyed with justification to relatives. Spain is a country that relies upon the

"Spanish Model of Organ Donation and Transplantation" and has been accredited with the highest rate of deceased organ donation for a whole country.[44] This model provides education to healthcare professionals, helping them to engage fully with organ donation and transplantation and has directly resulted in a continuous rise in the number of families willing to provide consent to donation.[45]

It needs to be recognised that whilst the individual decision whether or not to donate should be paramount, in many cases the final decision rests with relatives. Indeed, the most common reason for lack of organ donation is a failure to obtain consent from relatives of the potential donor.[46] This is attributed to families not being made fully aware of the prior wishes of the deceased.[47-49] Communicating an intention to donate to family members is frequently omitted.[50-51] This may be the reason that over half of all families approached for organ donation in the UK typically refuse to provide consent.[12] The importance of effective communication was addressed in this programme of study, with ~~the~~ results ~~of this study~~ ~~indicate~~ indicating that participants were more likely to engage in discussion about organ donation with family members after the ~~course~~ programme was completed. ~~of study.~~ The programme may have directly motivated such discussions or it could be that other emotive aspects, encountered during the course of study, may have prompted such discourse.

This study has shown that even within a small group, after a programme of study, the understanding about organ donation and the processes involved can be significantly improved, leading to consideration about donation of organs and decisions with relatives. This study aimed to capture any changes in knowledge and attitudes immediately after a programme of study and to determine whether there would be a concomitant response in organ donation registration and discussion behaviours. ~~Monitoring over a longer period may have resulted in a greater number of participants registering their organs for donation but this effect may have been influenced by other factors.~~ Registration rates of participants before commencing the study were akin to those of the general population[12] suggesting that choice of a caring vocation such as nursing does not necessarily equate with a greater degree of altruism with respect to organ donation. This observation that many healthcare professionals do not always exhibit pro-donation behaviours has been reported previously.[17-24] A considerable proportion of participants indicated that they associated registering as an organ donor with issues of mortality and this may help explain the relatively low level of donation. It has been suggested that the exhibition of unusually high levels of fear or anxiety about death[52-54] can prevent people from associating themselves with a behaviour that requires them to consider their own mortality.[55] It should also be noted that the cohort in this study was relatively young and would be less likely to have encountered life-threatening situations or serious illness. There were too few numbers in the older age groups to assess any trends with age.

The concept of brain death and what constitutes the legal definition of death has been frequently misunderstood by health care professionals.[11, 17, 19- 22] The results show that participants' understanding of brain death and the likelihood of recovery following a diagnosis of brain death improved significantly upon completion of the study. Although this is a promising result, a small proportion nevertheless continued to raise concerns about their understanding of this important concept. Correctly understanding brain death and the likelihood of recovery is paramount in the organ donation process to ensure that misconceptions are avoided and that relatives of the deceased can be properly informed to make confident end-of-life decisions.[47, 56-57]

The results demonstrate that prior to the programme of study, around one-third of participants did not understand which organs could be successfully donated after death and this was most pertinent in relation to the donation of corneal tissue – an organ that is not donated to save life but to restore sight. The programme of study improved understanding significantly. Less than a fifth of participants were aware of the many different methods that exist to register organ donation intentions in the UK before the programme; whilst this improved after completion of the programme, less than half of the cohort (42.0%) exhibited sufficient knowledge in this area. The increase in knowledge may have had an effect on attitude, as after the programme of study a greater number of participants were unwilling to support changes to legislation and favoured the current system of informed consent. This notwithstanding, the majority (64.0%) supported changes to the organ donation system in the UK.

The majority of participants in this study disapproved of a financially incentivised rewards scheme and this did not alter after the programme of study. This effect has been reported previously [35] and is thought to be because it appears to undermine the individual and cast doubt over their intentions to donate.[58]

This study used a pretest posttest design. The limitations of such a design are that the pretest may sensitise participants to what is being investigated and thereby affect posttest results. In this research, the intervention was a programme of study aimed at informing and teaching participants and hence the posttest was to determine what had been learned and understood and how this may alter attitudes and behaviour.

Given that participants will have been aware that they would be asked to complete a questionnaire after the programme of study, they may have paid more attention to the course content, than they otherwise would have done. The short duration between the intervention and the pre and post testing, minimised the effects of any external factors that could have occurred between testing and the programme. However, as the programme took place over a period of two months, there may have been influences from media or other social or community sources that participants encountered between lectures and that had some effect on the posttest results.

More insight into the benefits of such courses will be gained by investigating a wider diversity of cohorts and trialling longer courses of study so that participants have a longer period of time to consider whether to register for organ donation. As this study utilised a convenience sample to recruit participants from a single institution, the findings cannot be generalised to other nursing students from the UK. Further research from different parts of the county is needed to compare findings and to determine whether willingness to donate translates to improved attitudes to procuring organs for donation.

Conclusion

A short programme of study can effectively improve student nurses' knowledge of organ donation and positively influence their ability to discuss organ donation intentions with their family. ~~knowledge of and change in attitude and behaviour with respect to organ donation. The Significant changes in attitude and behaviour involved a increased willingness to discuss organ donation intentions with relatives and decrease in support for changing the current system of informed consent~~. The effect of education, whether concentrated and provided over a shorter period or given as a smaller component of a course emphasising various aspects of organ donation and procurement needs to be tested with different cohorts from various parts of the UK. This will help determine whether providing appropriate education to those who will be involved in procuring organs for transplantation can influence the number and types of organs that are donated.

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Competing interests

"All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that all authors had: (1) No financial support for the submitted work from anyone other than their employer; (2) No financial relationships with commercial entities that might have an interest in the submitted work; (3) No spouses, partners, or children with relationships with commercial entities that might have an interest in the submitted work; (4) No Non-financial interests that may be relevant to the submitted work."

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Author contribution

Conceived and designed the experiments: DM BP. Performed the experiments: DM. Analyzed the data: DM BP. Contributed materials/analysis tools: DM BP. Wrote the paper: DM BP. Guarantor: BP.

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