



Development of a Canadian deceased donation education program for health professionals: a needs assessment survey

Mise au point d'un programme de formation sur les dons d'organes de personnes décédées pour les professionnels de la santé: un sondage d'évaluation des besoins

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Abstract

Purpose The purpose of this survey was to determine how Canadian healthcare professionals perceive their deficiencies and educational requirements related to organ and tissue donation.

Methods We surveyed 641 intensive care unit (ICU) physicians, 1,349 ICU nurses, 1,561 emergency room (ER) physicians, and 1,873 ER nurses. The survey was distributed by the national organization for each profession (the Canadian Association of Emergency Physicians, the Canadian Association of Critical Care Nurses, and the National Emergency Nurses Association). Canadian Blood Services developed the critical care

physician list in collaboration with the Canadian Critical Care Society. Survey development included questions related to comfort with, and knowledge of, key competencies in organ and tissue donation.

Results Eight hundred thirty-one (15.3%) of a possible 5,424 respondents participated in the survey. Over 50% of respondents rated the following topics as highly important: knowledge of general organ and tissue donation, neurological determination of death, donation after cardiac death, and medical-legal donation issues. High competency comfort levels ranged from 14.7–50.9% for ICU nurses and 8.0–34.6% for ER nurses. Competency comfort levels were higher for ICU physicians (67.5–85.6%) than for ER physicians who rated all competencies lower. Respondents identified a need for a curriculum on national organ donation and preferred e-learning as the method of education.

Conclusions Both ICU nurses and ER practitioners expressed low comfort levels with their competencies regarding organ donation. Intensive care unit physicians had a much higher level of comfort; however, the majority of these respondents were specialty trained and working in academic centres with active donation and transplant programs. A national organ donation curriculum is needed.

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Résumé

Objectif L'objectif de ce sondage était de déterminer la façon dont les professionnels de la santé canadiens perçoivent leurs lacunes et leurs besoins éducationnels en ce qui touche au don d'organes et de tissus.

Méthode Nous avons envoyé un sondage à 641 médecins de l'unité de soins intensifs (USI), 1349 infirmiers et infirmières de l'USI, 1561 médecins urgentologues et 1873

infirmiers et infirmières d'urgence. Le sondage a été distribué par l'organisme national de chacun des corps de métier respectifs (l'Association canadienne des médecins d'urgence, l'Association canadienne des infirmiers/infirmières en soins intensifs, et l'Association nationale des infirmières et infirmiers d'urgence). La Société canadienne du sang a compilé la liste des médecins de soins intensifs en collaboration avec la Société canadienne des soins intensifs. La mise au point du questionnaire comprenait des questions liées à l'aise des répondants avec, et leurs connaissances, des compétences clés pour le don d'organes et de tissus.

Résultats Au total, 831 (15,3%) des 5424 répondants possibles ont participé au sondage. Plus de 50 % des répondants ont évalué les thèmes suivants comme étant très importants : les connaissances concernant le don d'organes et de tissus en général, le diagnostic de décès neurologique, le don après une mort cardiaque et les questions médico-légales entourant le don. Les niveaux d'aise de haute compétence allaient de 14,7 à 50,9 % chez les infirmiers et infirmières de l'USI et de 8,0 à 34,6 % chez les infirmiers et infirmières d'urgence. Les niveaux d'aise face à leurs compétences étaient plus élevés chez les médecins de l'USI (67,5-85,6 %) que chez les médecins d'urgence, qui ont évalué toutes leurs compétences de façon moins élevée. Selon les répondants, un programme sur le don d'organes à l'échelle nationale est nécessaire, et la méthode de formation préférée est l'apprentissage en ligne.

Conclusion Le personnel infirmier de l'USI et les praticiens de l'urgence ont tous exprimé être mal à l'aise quant à leur niveau de compétences concernant le don d'organes. Les médecins de l'unité de soins intensifs ont affiché un niveau d'aise beaucoup plus élevé; toutefois, la majorité de ces répondants étaient spécialisés et travaillaient dans des centres universitaires où des programmes de don d'organes et de greffe actifs sont en place. Un programme national sur le don d'organes est nécessaire.

Organ and tissue donation has the potential to improve the lives of thousands of Canadians each year. Studies have shown valuable benefits to organ donor families^{1,2} and transplant recipients³⁻⁵ and healthcare cost savings with transplantation.⁵ Steady improvements have been made in the rate of Canada's organ donations. Since 2006, donation rates have increased from 14.1 donors per million population (DPMP) (460 actual donors) to 18.2 DPMP (651 actual donors). Nevertheless, the discrepancy between supply and demand remains large. In 2015, 4,631 Canadians remained on the waiting list, and an additional

262 listed individuals died before receiving a transplant. These numbers do not include many other Canadians who were too ill to be listed or who were put on hold as disease progression meant they were no longer suitable for transplant.⁶

Even though the increase in donations is encouraging, Canada still underperforms with respect to its potential for organ and tissue donation. Estimated rates range from 48.5 DPMP to as high as 89 DPMP.⁷⁻⁹ While donor potential varies greatly in these studies, even the most conservative estimate shows much room for improvement. A recent Canadian study reported on missed donation opportunities in four hospitals over a three-year period. Of the 227 cases, 33% of these patients died in the emergency department and 59.9% died in an intensive care unit (ICU).¹⁰ Another review reported the potential to increase neurological determination of death (NDD) and donation after cardiac death (DCD) donors in the emergency department by 8% or 3.5 DPMP.⁷

As organ donation and technologies continue to evolve and be reported in the literature, we can anticipate more challenges regarding the identification of potential organ donors. While some countries have pursued uncontrolled DCD,¹¹ there are significant ethical reservations in Canadian practice and policy. As such, the current focus is to ensure that controlled DCD is offered in all provinces and to engage the emergency room (ER) community with respect to system accountability around identification, referral, and missed donation opportunities.

Although the reasons for missed donation opportunities are multifactorial, organ donation could conceivably be improved with education opportunities for healthcare professionals. For example, families are not always given the opportunity to donate, as healthcare professionals may be unaware of a potential donor or unsure of the process of donation referral. Furthermore, they may lack the proper training and skills to approach families effectively for donation conversations and/or to manage a donor until organ procurement.¹² In Canada, organ and tissue donation occurs infrequently in all but the largest ICUs and tertiary care centres. As a result, healthcare professionals may have limited knowledge of and exposure to the donation system, yet they could be key players in the identification, referral, and management of potential donors.

In Canada, there is a current lack of consistency across several domains of educational programs provided by provincial organ donation organizations (ODOs), professional societies, tissue banks, and transplant programs. These domains include curriculum content, pedagogical approach, leveraging of resources, and evaluation of outcomes. An environmental scan conducted by Canadian Blood Services (CBS) in 2015 revealed that education by provincial ODOs varies

significantly from province to province, with each organization delineating its own target audience, educational content, and priorities. In addition, formal assessment of learning is poor and lacks objectivity, with the majority of programs relying solely on written or verbal feedback from the participants.¹³ The Royal College of Physicians and Surgeons of Canada (RCPSC) residency training programs in Critical Care Medicine (both Adult and Pediatric) and Internal Medicine include organ and tissue donation as part of their objectives of training.^{14–16} The Canadian College of Family Physicians (CCFP) Family Medicine/Emergency Medicine residency program has taken similar steps for their trainees.¹⁷ Other key RCPSC residency training programs, such as Emergency Medicine, Neurosurgery, and Cardiology, lack such objectives. Similar to ODOs, even the residency programs with established donation-specific training objectives lack a consistent approach regarding content delivery and assessment. The Canadian Federation of Medical Students (CFMS-FEMC) has also recognized the lack of formal organ donation education in medical schools across Canada and produced a position paper in support of a national medical school organ and tissue donation curriculum.¹⁸

The organ and tissue donation community has expressed a desire for Canadian Blood Services to pursue the development of a coordinated national education program. A national professional education program would respond to both organizational and societal needs. It would not only provide the knowledge and tools to support donation in a manner that follows best clinical practice, but it would also build commitment and support of healthcare professionals to create a culture of donation in the healthcare system. Through education, there may be fewer missed donation opportunities, which could lead to an increase in the number of organ and tissue donors.

Nevertheless, the development of a successful educational curriculum is in large part dependent on paying particular attention to pre-identified deficiencies determined by key stakeholders. One method to identify such shortcomings is to conduct a needs assessment survey of healthcare providers involved in the donation process. The goal of this survey was to identify how Canadian healthcare professionals perceive their competencies related to organ and tissue donation and to understand participants' preferences regarding delivery of education on the topics identified.

Methods

Approval for this study was obtained from the Capital District Health Authority Research Ethics Board, Halifax,

Nova Scotia (REB File Number: CDHA-RS/2015-221; March, 2015).

Questionnaire development

A group of practitioners knowledgeable about organ and tissue donation identified a number of knowledge domains that healthcare professionals require for successfully identifying a potential organ donor, adopting a comfort level when approaching family members about organ donation, and managing the potential organ donor. Competencies were divided into four broad categories: General Donation; Neurological Determination of Death (NDD); Donation After Cardiac Death (DCD); Medical-legal considerations; and Donation Ethics. A survey questionnaire was then developed using these domains. Participants were asked to answer the same two questions using a five-point Likert scale for 18 different competencies concerning organ and tissue donation. The first two questions raised the issues of, "... comfort with this competency" and "... the importance of this to your work". Five competencies were removed from the ER survey, as they were not considered relevant to ER physicians' practice. The survey also included questions designed to identify practitioners' preferred method(s) of instruction on the subject of organ and tissue donation. An iterative process was used to refine the questions.

Questionnaire testing

Face validity and clinical sensibility

We assessed the comprehensiveness and clarity of the questionnaire using methodology described by Burns *et al.*¹⁹ The questionnaire was modified for clarity following review and comment by five practitioners who were knowledgeable about organ donation.

Content validity

To ensure the questionnaire met the stated objectives and covered all relevant topics, the survey instrument was given to a separate group of knowledgeable practitioners to identify any missing subject matter. No major topics were identified as missing.

Test-retest reliability

Eight practitioners involved in organ and tissue donation were asked to complete the survey twice at a two-week interval. There were no significant discrepancies between the responses.

Survey administration

Surveys were developed using an electronic survey tool (SelectSurvey.NET™, ClassApps, Kansas City, MO, USA) and distributed via email to healthcare professionals identified as primary targets for the national education curriculum. The survey was emailed (with an electronic link to the survey site) to 1,561 members of the Canadian Association of Emergency Physicians, 1,349 members of the Canadian Association of Critical Care Nurses, and 1,873 members of the National Emergency Nurses Association by their respective national organizations. The Canadian critical care physician list was developed by Canadian Blood Services in collaboration with the Canadian Critical Care Society and distributed to 641 ICU physicians. Each email notification provided participants with a brief introduction to the survey, including the purpose of the survey and statements about maintaining confidentiality of responses, the need to use only anonymized data, and the fact that responding to the survey implies presumed consent to participate in a donation educational program. Responses were collected into the SelectSurvey.NET database. Surveys were first sent electronically with a follow-up email at weeks 2 and 4. Controls were placed to allow only one response per respondent. Incomplete survey responses were included in survey results, as we recognized that some respondents might be uncomfortable responding to certain questions. No attempt was made to analyze data from non-respondents.

De-identified responses from SelectSurvey.NET automatically populated an Excel spreadsheet for analysis. Physician and institution characteristics, barriers to donation, as well as the different knowledge translation tools are reported using proportions. Participants used a five-point Likert scale (very low, low, average, high, and very high) to report self-knowledge about key competencies in organ and tissue donation as well as the importance of these competencies to their work. These responses are also reported using proportions.

The data were summarized using frequency and counts for categorical variables. Ordinal logistic regression was used to model the association between participant characteristics (type of medical training, academic vs community hospital) and categorical response variables (knowledge of key competencies in organ and tissue donation and perceived importance to their work). If the proportional odds assumption was violated, categories were collapsed (very low, low, and average; high and very high) and the Chi square test was performed. Associations identified in the analyses are expressed as odds ratios and 95% confidence intervals. A $P < 0.05$ was considered to be statistically significant.

Two questions were open ended — “In your experience, what factors facilitate organ and tissue donation?” and “Please list three topics related to organ donation and transplantation that you would like to see developed into educational sessions.” Responses were grouped into themes, coded, and then reported using proportions.

Results

Demographics

Table 1 shows background demographics and donation experience of the survey participants. Responses were collected from 831 of a possible 5,424 healthcare professionals, with an aggregated response rate of 15.3%. Response rates for the individual healthcare professions varied: 11.4% (214/1,873) of ER nurses, 12.6% (197/1,561) of ER physicians, 16.8% (226/1,349) of ICU nurses, and 30.3% (194/641) of ICU physicians participated in the survey. Although survey responses were obtained from across the country, the majority of responses were from individuals practicing in British Columbia, Alberta, Ontario, and Quebec.

Each year, 54.8% and 30.5% of ICU nurses were involved with more than one NDD donor and more than one DCD donor, respectively. Only 38.2% of emergency nurses and 31.5% of emergency physicians had more than one experience with NDD donation per year. A similar proportion of ER nurses and ER physicians had more than one experience with a DCD donor per year (31.8% and 25.4%, respectively).

The ICU physicians surveyed had significantly more exposure to organ donation, with 87.1% of participants involved with more than one NDD donor per year and 48.4% involved with more than one DCD donor per year. The ICU respondents worked largely in academic centres (82.5%) with active DCD programs (79%) and transplant programs (50%).

Competencies

Tables 2 and 3 summarize the responses to the questions regarding importance of organ donation and comfort with the process, respectively.

Fifty percent or more of ICU nurses, ICU physicians, and ER nurses rated all competencies related to general donation, NDD donation, DCD donation, and medical-legal donation issues as having high or very high importance to their work. More than 50% (67.5–85.6%) of ICU physicians rated comfort with these competencies as high or very high. Intensive care unit nurses (14.7–

Table 1 Background demographic and donation experience

	ICU Nurses	ER Nurses	ER Physicians	ICU Physicians
Response Rate (<i>n</i>)	16.8% (226)	11.4% (214)	12.6% (197)	30.3% (194)
Adult Centre/Pediatric Centre	93% / 7%	95% / 5%	97% / 3%	79% / 19%
Academic Centre/Community Centre	69% / 31%	50% / 50%	46% / 54%	82% / 18%
Transplant Centre	43%	30%	29%	50%
Centre with a DCD program	60%	47%	53%	79%
Donation Experience				
>1 NDD/year	54.8%	38.2%	31.5%	87.1%
>1 DCD/year	30.5%	31.8%	25.4%	48.4%
Background Training	—	—	CCFP: 36.5% FRCPC: 32.5% FP: 28.4%	FRCPC: 90.7% No ICU training: 4.1%
Percentage of Respondents by Province				
BC	15.5%	21.0%	15.7%	8.8%
AB	15.5%	34.6%	10.7%	12.9%
SK	3.5%	2.8%	4.1%	3.1%
MB	8.4%	5.6%	5.6%	2.6%
ON	28.8%	15.4%	43.7%	47.9%
QC	15.0%	2.8%	6.6%	16.5%
NB	3.5%	6.5%	1.0%	—
NS	6.2%	6.5%	6.6%	5.2%
PEI	0.9%	0.5%	1.0%	—
NL	2.7%	2.5%	2.0%	3.1%
NWT	—	1.4%	3.1%	—
Time in practice				
≤ 5 yr	11.1%	8.4%	41.6%	18.6%
5-10 yr	15.5%	18.2%	9.1%	19.6%
10-15 yr	12.0%	13.1%	13.2%	15.0%
15-20 yr	10.6%	11.7%	8.6%	19.6%
≥ 20 yr	50.9%	48.6%	27.4%	27.3%
Type of ICU				
Med-Surg-Neuro	27.9%	—	—	52.6%
Med-Surg	50.4%	—	—	35.1%
Medical	5.3%	—	—	1.6%
Surgical	2.2%	—	—	1.6%
Cardiac	12.8%	—	—	5.7%
Neuro	0.4%	—	—	1.0%

CCFP = Canadian College of Family Physicians; DCD = donation after cardiac death; ER = emergency room; FP = Family Physicians; FRCPC = Fellow of the Royal College of Physicians of Canada; ICU = intensive care unit; NDD = neurological determination of death

50.9%) and ER nurses (8.0-34.6%) had a significantly lower comfort level.

Emergency room physicians rated knowledge of key competencies in organ donation much lower in importance compared with the other groups. Only three competencies were rated as high or as very high importance by 50% or more of respondents, i.e., “offering families the opportunity for donation”, “identification of potential tissue donors”, and “the referral process for potential

tissue donors”. Similarly, ER physicians rated their comfort level with the key competencies as very low. No competency received a comfort rating of high or very high by 50% or more of ER physician respondents (range 6.1-38.6%).

Responses were also analyzed according to community and academic respondents (Tables 4 and 5). Community practitioners described less knowledge of and comfort with competencies in several domains (e.g., diagnosis of brain

Table 2 Importance of organ donation: combined high/very high & low/very low proportions

Competency	ICU Nurses H/VH% (n) L/VL/NA%(n)	ER Nurses H/VH% (n) L/VL/NA%(n)	ER Doctors H/VH% (n) L/VL/NA%(n)	ICU Doctors H/VH%(n) L/VL/NA%(n)
<i>General Donation</i>				
The benefits of organ and tissue donation	72.5 (164) 4.9 (11)	68.2 (146) 6.6 (14)	43.7 (86) 21.3 (42)	80.4 (156) 3.1 (6)
Offering families the opportunity for organ and tissue donation	72.6 (164) 6.6 (15)	72.4 (155) 7.0 (15)	50.8 (100) 14.7 (29)	83.5 (162) 2.1 (4)
Identification of potential tissue donors	75.7 (171) 5.8 (13)	68.7 (147) 6.6 (14)	53.8 (106) 14.7 (29)	72.2 (140) 3.1 (6)
The referral process for tissue donation	73.4 (166) 6.6 (15)	68.7 (147) 8.9 (19)	52.3 (103) 12.7 (25)	73.2 (142) 3.6 (7)
<i>Neurological Determination of Death</i>				
Identification of potential brain death donors	73.0 (165) 6.2 (14)	58.4 (125) 8.9 (19)	37.1 (73) 23.4 (46)	82.5 (160) 2.1 (4)
Diagnosis of brain death	64.6 (146) 5.8 (13)	49.5 (106) 11.2 (24)	30.5 (60) 30.0 (59)	84.5 (164) 2.1 (4)
Explaining brain death to the family	69.1 (156) 6.2 (14)	56.1 (120) 11.7 (25)	37.1 (73) 25.9 (51)	85.6 (166) 1.6 (3)
Management of a potential brain death donor until transfer to an organ procurement centre	69.5 (157) 3.5 (8)	58.4 (125) 12.2 (26)	33.5 (66) 24.9 (49)	68.0 (132) 2.6 (5)
Management of a potential brain death donor until organ procurement	69.9 (158) 4.0 (9)	53.3 (114) 13.6 (29)	—	82.5 (160) 3.1 (6)
<i>Donation After Cardiac Death</i>				
Identification of potential donation after cardiac death donors	61.5 (139) 7.5 (17)	60.8 (130) 9.3 (20)	40.6 (80) 20.3 (40)	69.1 (134) 6.7 (13)
Management of end of life issues in a donation after cardiac death donor	63.3 (143) 6.7 (15)	59.8 (128) 8.0 (17)	—	69.6 (135) 5.7 (10)
Determination of death in a donation after cardiac death donor	51.4 (116) 9.3 (21)	51.8 (111) 8.9 (19)	—	68.6 (133) 6.7 (13)
The referral process for deceased donation	60.6 (137) 8.8 (20)	61.2 (131) 7.5 (16)	38.0 (75) 17.8 (35)	67.5 (131) 4.6 (9)
<i>Medicolegal Considerations, Ethics and Transplant</i>				
Consent discussions for organ and tissue donation	53.5 (121) 4.8 (11)	56.1 (120) 8.0 (17)	—	72.7 (141) 6.7 (13)
Ethical considerations in deceased donation	57.6 (130) 5.3 (12)	55.6 (119) 7.5 (16)	37.6 (74) 17.3 (34)	79.4 (154) 4.6 (9)
Legal considerations in deceased donation	54.5 (123) 7.1 (16)	55.6 (119) 10.3 (22)	31.0 (61) 22.8 (45)	68.0 (132) 5.2 (10)
Recipient prioritization and organ allocation	34.0 (77) 16.8 (38)	32.3 (69) 21.0 (45)	—	25.3 (49) 24.2 (47)
Organ transplant outcomes	41.6 (94) 8.9 (20)	40.7 (87) 12.2 (26)	22.4 (44) 34.0 (67)	38.7 (75) 15.0 (29)

ER = emergency room; ICU = intensive care unit

H = high; L = low; VH = very high; VL = very low

Table 3 Comfort level with organ donation: combined high/very high and low/very low proportions

Competency	ICU Nurses H/VH% (n) L/VL/NA%(n)	ER Nurses H/VH% (n) L/VL/NA%(n)	ER Doctors H/VH% (n) L/VL/NA%(n)	ICU Doctors H/VH% (n) L/VL/NA%(n)
<i>General Donation</i>				
The benefits of organ and tissue donation	50.9 (115) 8.9 (20)	34.6 (74) 24.3 (52)	38.6 (76) 17.3 (34)	88.7 (172) 0.0 (0)
Offering families the opportunity for organ and tissue donation	32.7 (74) 28.8 (65)	23.4 (50) 38.8 (83)	20.3 (40) 31.0 (61)	83.5 (162) 0.52 (1)
Identification of potential tissue donors	40.2 (91) 22.1 (50)	25.7 (55) 39.7 (85)	16.7 (33) 42.7 (84)	75.2 (146) 3.1 (6)
The referral process for tissue donation	44.3 (100) 20.4 (46)	23.4 (50) 41.6 (89)	23.3 (46) 49.3 (97)	73.7 (143) 2.6 (5)
<i>Neurological Determination of Death</i>				
Identification of potential brain death donors	41.6 (94) 17.3 (39)	15.9 (34) 41.6 (89)	15.8 (31) 42.6 (84)	91.2 (177) 2.1 (4)
Diagnosis of brain death	31.9 (72) 14.2 (32)	9.8 (21) 40.7 (87)	9.6 (19) 48.7 (96)	90.7 (176) 2.6 (5)
Explaining brain death to the family	35.8 (81) 19.0 (43)	16.8 (36) 40.7 (87)	19.8 (39) 34.0 (67)	89.2 (173) 0.5 (1)
Management of a potential brain death donor until transfer to an organ procurement centre	37.6 (85) 21.2 (48)	12.6 (27) 45.3 (97)	9.6 (19) 54.3 (107)	67.0 (130) 3.1 (6)
Management of a potential brain death donor until organ procurement	42.1 (95) 19.0 (43)	11.7 (25) 46.3 (99)	—	83.0 (161) 1.6 (3)
<i>Donation After Cardiac Death</i>				
Identification of potential donation after cardiac death donors	20.8 (47) 36.7 (83)	17.8 (38) 42.5 (91)	9.6 (19) 49.2 (97)	58.3 (113) 7.2 (14)
Management of end of life issues in a donation after cardiac death donor	24.4 (55) 30.1 (68)	15.0 (32) 44.4 (95)	—	59.3 (115) 8.3 (16)
Determination of death in a donation after cardiac death donor	18.6 (42) 31.0 (70)	14.5 (31) 42.1 (90)	—	63.4 (123) 10.3 (20)
The referral process for deceased donation	28.3 (64) 32.7 (74)	19.6 (42) 40.7 (87)	9.6 (19) 51.3 (101)	59.8 (116) 9.8 (19)
<i>Medicolegal Considerations, Ethics and Transplant</i>				
Consent discussions for organ and tissue donation	19.5 (44) 30.1 (68)	12.6 (27) 46.7 (100)	—	59.8 (116) 6.2 (12)
Ethical considerations in deceased donation	27.4 (62) 28.3 (64)	15.9 (34) 44.9 (96)	16.2 (32) 36.6 (72)	71.1 (138) 3.1 (6)
Legal considerations in deceased donation	14.7 (33) 42.0 (95)	8.0 (17) 57.5 (123)	6.1 (12) 59.9 (118)	52.1 (101) 9.3 (18)
Recipient prioritization and organ allocation	5.8 (13) 40.7 (92)	3.7 (8) 57.5 (123)	—	11.3 (22) 30.9 (60)
Organ transplant outcomes	13.8 (31) 29.6 (67)	5.2 (11) 50.0 (107)	2.5 (5) 62.4 (123)	23.7 (46) 23.2 (45)

ER = emergency room; ICU = intensive care unit

H = high; L = low; VH = very high; VL = very low

Table 4 Importance of competencies analyzed by community vs academic respondents

Competency	Result	P Value	OR (95% CI)
<i>Importance</i>			
<i>ICU Physician Competencies</i>			
Diagnosis of brain death	Community doctors were significantly more likely to rate this with a lower value compared with academic doctors	0.026*	
Explaining brain death to the family	Community doctors were significantly more likely to respond to this question with a lower value than academic doctors	0.005	0.25 (0.09 to 0.66)
Consent discussions	Community doctors were significantly more likely to respond to this question with a lower value than academic doctors	0.002	0.29 (0.13 to 0.65)
Ethical considerations	Community doctors are significantly more likely to respond to this question with a lower value than academic doctors	0.003	0.26 (0.11 to 0.62)
Legal considerations	Community doctors were significantly more likely to respond to this question with a lower value than academic doctors	0.004	0.32 (0.32 to 0.69)
<i>Emergency Nurses Competencies</i>			
Identification of potential brain death donors	Community nurses were significantly more likely to respond to this question with a lower value than academic nurses	0.034	0.51 (0.27 to 0.95)
Diagnosis of brain death	Community nurses were significantly more likely to respond to this question with a lower value than academic nurses	0.010	0.44 (0.24 to 0.83)
Management of End of Life Issues	Community nurses were significantly more likely to respond to this question with a lower value than academic nurses	0.035	0.49 (0.25 to 0.95)
Consent Discussions	Community nurses were significantly more likely to respond to this question with a lower value than academic nurses	0.024	0.47 (0.25 to 0.91)

*Asterisks represent those tests that did not fit the proportional odds assumption for the cumulative logit model or the proportional hazards model; therefore, very low, low, and average results were combined and compared with high and very high using Chi square test. CI = confidence interval; ICU = intensive care unit; OR = odds ratio

death and consent discussions) compared with their academic counterparts.

For ER physicians, level of physician training appeared to have an impact on comfort with NDD and DCD competencies. In general, ER physicians with FRCPC-EM training were more comfortable with competencies than those with CCFP-EM training or family physicians working in the emergency department without further training (Electronic Supplementary Material [ESM]; Table 1).

Despite the varied responses of importance and comfort level with deceased donation, the majority of all healthcare groups viewed donation as high in value and thought a donation curriculum would result in a moderate-high benefit to their practice (ESM; Table 2).

With respect to facilitating donation, several ER physicians commented on the difficulty of becoming involved with a potential donor in a busy ER, and 59.5% of participants listed dedicated resources as a key facilitator for donation (ESM; Table 3).

Curriculum content and delivery

The final section of the survey explored the preferred educational topics and tools that could be used to deliver

the education sessions. There was remarkable commonality between groups in both areas (Table 6). Identification and referral, communicating with families, donor management, and DCD were the top educational topics requested by all four healthcare professions.

All groups rated online modules as the highest preference for curriculum delivery. The remaining top three choices were facilitated workshops, an online study guide, and videos.

Discussion

We developed this survey of both ICU and ER physicians and nurses in response to a request from the professional community that Canadian Blood Services provide further education regarding the organ donation process. The reported donation experience from our respondents mirrors the fact that organ donation is a rare event in Canada. Respondents reported a low comfort level and a knowledge gap in terms of identifying and managing potential organ donors and a need for further education on these important events.

The majority of ICU nurses, ER nurses, and ICU physicians rated the importance of key competencies as

Table 5 Comfort with competencies analyzed by community vs academic respondents

Competency	Result	P Value	OR (95% CI)
<i>ICU Physicians</i>			
Consent discussions	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.010	0.36 (0.17 to 0.79)
<i>ICU Nurses</i>			
Organ Transplant Outcomes	Community nurses were significantly more likely to rate this question with a lower value than academic nurses	0.037	0.48 (0.25 to 0.96)
<i>Emergency Physicians</i>			
The benefits of organ and tissue donation	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.009	0.49 (0.28 to 0.84)
Offering families the opportunity	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.044*	
The referral process for tissue donation	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.001	0.39 (0.23 to 0.67)
Identification of brain death donors	Community doctors were significantly more likely to rate to this question with a lower value than academic doctors	0.007	0.45 (0.26 to 0.80)
Diagnosis of brain death	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.005*	
Explaining brain death to the family	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.008*	
Management of a NDD donor until transfer	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.002	0.38 (0.20 to 0.70)
Identification of a potential DCD donor	Community doctors were significantly more likely to rate this question with a lower value than academic doctors	0.035	0.53 (0.30 to 0.96)

*Astericks represent those tests that did not fit the proportional odds assumption for the cumulative logit model or the proportional hazards model; therefore, very low, low, and average results were combined and compared with high and very high using Chi square test. CI = confidence interval; DCD = donation after cardiac death; ICU = intensive care unit; NDD = neurological determination of death; OR = odds ratio

high or very high (Table 2). Although ER physicians viewed donation as highly valuable, they reported the competencies as having low importance to their work. In addition, ICU nurses, ER nurses, and ER physicians reported a low comfort level with most of the donation competencies (Table 3). The gap in the participants' perceived competencies (i.e., high importance but low comfort level) and the lack of engagement by ER physicians highlight the need for the proposed national donation curriculum.

In Canada, the current approaches to evaluation, reporting, identification, and referral of potential donors are fragmented and lack consistency, timeliness, and ease of access to information. While it is clear that the emergency department is the gateway for most potential donors, the lack of system-wide death audits in Canada limits the inferences made on the magnitude of missed donation opportunities arising from the ER. Nevertheless, survey responses from ER physicians suggest that there is an opportunity to provide education to these front-line workers by emphasizing their important role as champions for donation and their ability to decrease missed donation opportunities.

Our results suggest a strong signal that the pressure of a busy, already overburdened emergency department is playing at least some role in the responses provided by the ER physicians. This is important to consider when designing a curriculum for the emergency department. The emphasis in the curriculum content for ER practitioners should be placed on a smaller number of high-yield competencies (e.g., identification and referral, how to support a donation program in your institution) with quick and easy tools to access both at the bedside and for ODO support.

The importance of integrating emergency department healthcare providers in the organ donation process has been recognized globally. A 2010 UK workshop highlighted organ donation as a core competency for the ER providers, with a specific focus on the ability to identify and refer potential NDD and DCD donors. As with Canada, although their national data were limited, many regional death chart audits suggest that the ER was a notable source of missed donation opportunities.²⁰ Spain, a world leader in donation, contributes high donation rates, partly due to a concerted effort between emergency, intensive care, and organ donation healthcare professionals. A recently

Table 6 Curriculum content and delivery

	ICU Nurses	ER Nurses	ER Physicians	ICU Physicians
Requested Instructional Methods	1. Online Module	1. Online Module	1. Online Module	1. Online Module
	2. Workshop	2. Workshop	2. Online Study Guide	2. Workshop
	3. Video	3. Video	3. Workshop	3. Video
	4. Online Study Guide	4. Online Study Guide	4. Video	4. Online Study Guide
Top 5 Educational Sessions	1. I & R	1. I & R	1. I & R	1. Donor Management
	2. Communication	2. Communication	2. Communication	2. DCD
	3. Donor Management	3. Donor Management	3. Donor Management	3. Communication
	4. DCD	4. Supporting Donation at your Institution	4. Supporting Donation at your Institution	4. I & R
	5. Transplant Outcome	5. Care of the Donor Family	5. DCD	5. NDD Declaration

DCD = donation after cardiac death; ER = emergency room; ICU = intensive care unit; I&R = identification and referral; NDD = neurological determination of death

published article described the country's strategy to reach a donation rate of 40 DPMP. The first of its three objectives is "promoting the identification and early referral of possible organ donors from outside of the ICU to consider elective non-therapeutic intensive care".²¹ Education on how to implement this plan is part of a national curriculum for ICU and emergency care providers. Also, the Organización Nacional de Trasplantes and the Spanish Society of Emergency Medicine have collaborated to develop recommendations on the role that emergency healthcare providers play in the organ donation process.

In contrast, when reviewing the results from the ICU respondents, we should consider the extensive experience of the practitioners surveyed (Table 3). Perhaps an education program would be more appropriately directed to ICU trainees instead of healthcare professionals who have completed training and are out in practice. Nevertheless, it is worth noting that, even in this highly trained and experienced group of physicians, only 83% reported high/very high comfort with management of an NDD donor until organ recovery. Also, the reports of high/very high comfort with DCD donor identification, management of end-of-life issues, and declaration of death were 58.3%, 59.3%, and 63.4%, respectively. These results, combined with the previously mentioned data on missed donation opportunities, suggest a role for donation education for all practitioners surveyed, including the ICU physicians. Finally, our results may not reflect the average practicing ICU physician in Canada as many ICUs are not run by physicians trained in intensive care medicine.

All participants valued organ donation highly. Support for a national curriculum, as providing a moderate-high

benefit to the individuals practice, ranged from 60-70%. While encouraging, this still suggests that 30-40% of our respondents do not think an education program would be of significant benefit. This opinion will likely provide challenges to participation and uptake when the program is launched.

Our findings could have significant implications with regard to the development of an education curriculum and the relevant tools for knowledge translation. In addition to the core curriculum, quick and easy bedside tools are needed, possibly in the form of a donation-based online application. The frequency of education "refreshers" will also be important after the initial curriculum has been successfully completed. This will help maintain competency given the low frequency with which an individual practitioner may be exposed to organ donation.

The top choices for curriculum delivery across all healthcare professional groups included online e-learning modules supported by other educational tools such as online study guides, workshops, and videos. There was also commonality regarding the top five requested educational sessions, with some unique differences between the professions in the other requested sessions. For example, both ER and ICU nurses requested education on care of the donor family, while ER nurses and physicians requested education on how to support donation in your institution. These responses lend well to a core curriculum for all healthcare providers with electives based on an individual's background and interest.

This survey has several limitations—most notably the low response rate. Consequently, the respondent pool may not be reflective of the group as a whole, and the educational needs identified in this survey may not meet

the requirements of the larger group of non-respondents. In our view, with more than 800 respondents from across the country, we have nevertheless identified sufficient numbers to develop a curriculum in response to the identified needs assessment for education.

In conclusion, this study was designed to characterize deficiencies in essential competencies related to organ and tissue donation and to understand participants' preferences for delivery of education on topics related to deceased donation. We expect that the information gained from this survey will be invaluable in guiding the design and development of a much needed national curriculum on deceased donation.

Conflicts of interest None declared.

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References

- Jacoby L, Jaccard J. Perceived support among families deciding about organ donation for their loved ones: donor vs nondonor next of kin. *Am J Crit Care* 2010; 19: e52-61.
- Rodrigue JR, Cornell DL, Howard RJ. The instability of organ donation decisions by next of kin and factors that predict it. *Am J Transplant* 2008; 8: 2661-7.
- Schnitzler MA, Whiting JF, Brennan DC, et al. The life-years saved by a deceased organ donor. *Am J Transplant* 2005; 5: 2289-96.
- Dew MA, Switzer GE, Goycoolea JM, et al. Does transplantation produce quality of life benefits? A quantitative analysis of the literature. *Transplantation* 1997; 64: 1261-73.
- Whiting JF, Kiberd B, Kalo Z, Keown P, Roels L, Kjerulf M. Cost-effectiveness of organ donation: evaluating investment into donor action and other donor initiatives. *Am J Transplant* 2004; 4: 569-73.
- Canadian Blood Services. Progress Reports. Available from URL: <https://blood.ca/en/about-us/progress-reports> (accessed February 2017).
- Trifunov R. Deceased Organ Donor Potential in Canada – A Review and Estimate from Past Studies and Sources 2010-05-20. Available from URL: <http://www.ccdt.ca/committee/organ/Jun72010/Deceased> Organ Donor Potential in Canada 2010-05-20.pdf (accessed February 2017).
- Canadian Institute for Health Information. Deceased Organ Donor Potential in Canada - 2014. Available from URL: https://www.cihi.ca/web/resource/en/organdonorpotential_2014_en.pdf (accessed February 2017).
- Rose C, Nickerson P, Delmonico F, Randhawa G, Gill J, Gill JS. Estimation of potential deceased organ donors in Canada. *Transplantation* 2016; 100: 1558-63.
- Kutsogiannis DJ, Asthana S, Townsend DR, Singh G, Karvellas CJ. The incidence of potential missed organ donors in intensive care units and emergency rooms: a retrospective cohort. *Intensive Care Med* 2013; 39: 1452-9.
- Dominguez-Gil B. Kidney transplantation from uncontrolled donors after circulatory death: the Spanish experience - 26th International Congress of the Transplantation Society; 2016 Available from URL: <https://tts.guide/lectures/view/1014> (accessed February 2017).
- Canada's Organ Donation and Transplantation Community; Canada's Tissue Donation and Transplantation Community; Canadian Blood Services. Call To Action. *Organsandtissues.ca*. 2011. Available from URL: <http://www.organsandtissues.ca/wp-content/uploads/2012/06/OTDT-INDX-final-C2A.pdf> (accessed February 2017).
- Canadian Blood Services. Environmental Scan of Professional Education for Donation. Canadian Blood Services, 2016. Available from URL: <https://profedu.blood.ca/en/organs-and-tissues/deceased-donation/reports> (accessed March 2016).
- Royal College of Physicians and Surgeons of Canada. Objectives of Training in the Subspecialty of Adult Critical Care Medicine – 2014. Available from URL: <http://www.royalcollege.ca/cs/groups/public/documents/document/y2vk/mdaw/~edisp/tztest3rpsced000888.pdf> (accessed February 2017).
- Royal College of Physicians and Surgeons of Canada. Objectives of Training in the Subspecialty of Pediatric Critical Care Medicine (Pediatric) – 2014. Available from URL: <http://www.royalcollege.ca/cs/groups/public/documents/document/y2vk/mdaw/~edisp/tztest3rpsced000891.pdf> (accessed February 2017).
- Royal College of Physicians and Surgeons of Canada. Objectives of Training in the Specialty of Internal Medicine – 2011. Available from URL: <http://www.royalcollege.ca/cs/groups/public/documents/document/y2vk/mdaw/~edisp/tztest3rpsced000910.pdf> (accessed February 2017).
- Steiner IP, Patton MA, MacKey DS. Educational Reference Manual Core Emergency Medicine Training in Family Medicine Residency Programs. Available from URL: <http://www.cfpc.ca/uploadedFiles/Education/CoreFamilyMed-ResidencyPrograms.pdf> (accessed February 2017).
- Chen BY, Fletcher A, Damji AN, et al. Organ and Tissue Donation in Canadian Undergraduate Medical Education. Canadian Federation of Medical Students; 2017. Available from URL: http://www.cfms.org/files/meetings/sgm-2016/resolutions/20-Organ_and_Tissue_Donation_Proposal_R.pdf (accessed February 2017).
- Burns KE, Duffett M, Kho ME, et al. A guide for the design and conduct of self-administered surveys of clinicians. *CMAJ* 2008; 179: 245-52.
- British Transplantation Society. The Role of Emergency Medicine in Organ Donation - 2010. Available from URL: <https://bts.org.uk/wp-content/uploads/2016/09/Role-of-emergency-Medicine-in-Organ-Donation.pdf> (accessed February 2017).
- Matesanz R, Domínguez-Gil B, Coll E, Mahillo B, Marazuela R. How Spain reached 40 deceased organ donors per million population. *Am J Transplant* 2017. DOI:10.1111/ajt.14104.