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3 Manuscript title: Organ donation by trauma and non-trauma patients in a Canadian province: a  
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5 retrospective analysis  
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## Abstract

**Background:** Trauma victims represent a large pool of potential organ donors (PODs). Our objective was to describe organ donation (OD) by trauma and non-trauma patients in Nova Scotia.

**Methods:** Retrospective cohort study of all major trauma patients in the Nova Scotia Trauma Registry who were injured between April 1, 2009 to March 31, 2016 and died in-hospital, as well as all PODs captured in the Nova Scotia Legacy of Life Donor Registry over the same period. We compared characteristics of trauma patients who were or were not PODs. In addition, we described OD by trauma and non-trauma PODs, calculated conversion rates, and evaluated reasons for non-donation.

**Results:** Overall, 940 patients were included in the analysis, of which 689 were trauma patients. Trauma victims accounted for 37% (48/129) of donors. Of all trauma-related deaths in provincial hospitals, 40% (274/689) were identified as PODs and 7% (48/689) successfully donated organs. Only 39% (108/274) of these patients were referred to the Legacy of Life Program for OD. Conversion rates were 84% (48/57) in trauma patients and 84% (81/97) in non-trauma patients. Donation after circulatory death occurred in 17% of trauma cases and 16% of non-trauma cases. Family refusal (28/60; 47%) and medical unsuitability (18/60; 30%) were the most common reasons for non-donation in trauma patients.

**Interpretation:** The conversion rate was 84% in both trauma and non-trauma patients; however, we identified a large number of trauma PODs that were not referred for OD. Further work is required to improve OD within the trauma population.

## Introduction

Organ transplantation is the only therapeutic option for patients with terminal organ failure; however, the supply of solid organs remains inadequate to meet demands.<sup>1-3</sup> The organ donation (OD) and transplantation system in Canada is underperforming.<sup>2</sup> Although 2559 organ transplants were performed in 2015, 4631 patients remained on the waitlist by year's end and 262 died waiting for a transplant.<sup>2</sup> Trauma victims represent a large pool of potential organ donors (PODs), and many have suggested opportunities to improve OD rates in these patients.<sup>4-9</sup> Given the discrepancy between demand and performance, it is critical to evaluate trauma patients as potential donors.<sup>3,4,10</sup>

Previous investigations describe a trend towards fewer Canadian donors dying from head trauma and an increasing median age of deceased donors, attributable in part to positive developments in the prevention and care of brain injuries.<sup>11-13</sup> Despite an increase in OD over the last decade, Canada's donation and transplantation rates per million people remain well below other countries such as Spain, Croatia, and the United States.<sup>2</sup> Physicians have important roles in the OD process, from leading the management of trauma patients to the recognition and referral of PODs to local organ procurement organizations (OPOs). To better understand the epidemiology of OD by trauma patients, we linked patient records from a provincial trauma registry and a provincial OPO. The objectives of our study were: 1) to compare characteristics of deceased trauma PODs and non-PODs; 2) to compare OD by trauma and non-trauma patients; and 3) to characterize missed referrals and reasons for non-donation.

## Methods

### Study design and population

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3 Retrospective cohort study using data from the Nova Scotia Trauma Registry (NSTR) and  
4 the Nova Scotia Legacy of Life Donor Registry (LLDR). Participants from the NSTR included all  
5 major trauma patients in Nova Scotia (as well as referred patients from Newfoundland, New  
6 Brunswick, and Prince Edward Island) injured April 1, 2009 - March 31, 2016 and who died in  
7 any Nova Scotia hospital. We also included all patients (trauma and non-trauma) in the LLDR  
8 over the same 7-year period. Data from the NSTR and LLDR were linked to identify trauma  
9 patients with a record in both registries. This study was performed in accordance with the  
10 Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for  
11 reporting observational studies.<sup>14</sup> Study approval was obtained from the Nova Scotia Health  
12 Authority Research Ethics Board.  
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### 28 **Data sources**

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30 The NSTR is a provincial population-based trauma registry under the Nova Scotia  
31 Department of Health & Wellness with data on all patients having an Injury Severity Score (ISS)  
32  $\geq 12$  and an appropriate International Classification of Disease External Cause of Injury Code  
33  $\geq 12$  and an appropriate International Classification of Disease External Cause of Injury Code  
34 (ICD-10-CA).<sup>15</sup> In addition, the NSTR includes penetrating traumas with an ISS  $\geq 9$ , all trauma  
35 team activations (TTAs) regardless of ISS, and traumas resulting in death pre-hospital or in the  
36 emergency department (ED). The NSTR has quality control procedures in place to ensure  
37 accurate and complete data entry.  
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47 The Legacy of Life Program was created in 2006 to raise awareness about the importance  
48 of organ and tissue donation and to encourage the public to donate.<sup>16</sup> The program maintains the  
49 LLDR which contains data on PODs from across the province who were transferred to the Queen  
50 Elizabeth II Health Science Centre (QEII HSC) in Halifax, as well as information on PODs who  
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3 were not referred to the Legacy of Life Program as determined through retrospective death audits  
4 of charts. The QEII HSC is the only site in the Maritimes performing OD (after neurologic or  
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6 cardiocirculatory determination of death) and solid organ transplantation.  
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## 10 11 12 **Study definitions**

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15 Criteria used to identify PODs in the NSTR were based on recommendations from the  
16 Deceased Donor Data Working Group;<sup>17</sup> a POD was defined as a trauma patient who died in any  
17 Nova Scotia hospital, had an appropriate ICD-10-CA injury code (see Appendix A), and received  
18 mechanical ventilation during their hospital stay. The LLDR definition of a POD was a patient  
19 meeting the following criteria after transfer and assessment at the QEII HSC (note: there were  
20 minor changes to this criteria from 2009-2013 to 2014-2016): 1) Glasgow Coma Scale (GCS)  $\leq$   
21 5T (2009-2013) **or** grave prognosis or GCS  $\leq$  5T (2014-2016); 2) irreversible brain injury (2009-  
22 2013) **or** injured brain or non-recoverable injury or illness (2014-2016); 3) patient intubated and  
23 ventilator-dependent; and 4) end of life discussion held with family and decision made to  
24 withdraw life sustaining therapy. A missed referral was a potential donor who met all four criteria  
25 but was not referred to the Legacy of Life Program.  
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40 An eligible donor in the LLDR was defined as a POD referred to the Legacy of Life  
41 Program, deemed medically suitable, and whose family was willing to proceed with donation.  
42 There were two types of eligible donors: 1) donation after neurological determination of death  
43 (NDD); and 2) donation after circulatory death (DCD). The conversion rate (i.e., actual donors  
44 divided by eligible donors) and the consent rate (i.e., PODs with family consent obtained divided  
45 by PODs approached for consent) were determined based on data from the LLDR. If an eligible  
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3 POD later became medically unsuitable for donation, they were excluded from the conversion  
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5 rate.  
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### 10 **Data collection**

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12 Data collected from the NSTR included age, gender, , injury date, injury location (within  
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14 Halifax Regional Municipality [HRM] vs outside HRM), injury type (blunt, penetrating, burn,  
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16 drowning/asphyxia), injury cause, ICD-10-CA injury code, transport mode to final institution  
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18 (land, air [included both helicopter and fixed-wing aircraft], combination land/air, private vehicle,  
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20 walk-in), intermediate facilities, trauma team activation (TTA), scene GCS, ISS, Abbreviated  
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22 Injury Score (AIS), intensive care unit (ICU) length of stay (LOS), in-hospital LOS, mechanical  
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24 ventilation requirement, comorbidities, residential postal code, and institution where death  
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26 occurred.  
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31 From the LLDR, we collected data on organ donors (potential, eligible, actual), organs  
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33 procured (number, type), missed referrals, and reasons for non-donation. We also collected  
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35 whether the patient indicated their intent to donate by signing their provincial Medical Services  
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37 Insurance (MSI) Health Card, and if they intended to donate all organs (Donor 1) or specific  
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39 organs (Donor 2). Any variables with missing values were noted in the results.  
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### 45 **Data analysis**

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47 The sample size for this study was dependent on the number of in-hospital deaths in the  
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49 NSTR and the number of patients in the LLDR during the study period. We characterized patients  
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51 using descriptive statistics including means, standard deviations (SD), and proportions. Data on  
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53 injury cause, ICD-10-CA injury codes, diagnoses of potential donors, and patient comorbidities  
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3 were grouped into appropriate categories. We compared characteristics of trauma patients who  
4 did or did not meet the NSTR definition of a POD, as well as demographics of trauma donors and  
5 non-trauma donors using Student's t-tests, chi square analysis, and Fisher's exact test as  
6 appropriate. In keeping with the privacy policy of the Nova Scotia Department of Health and  
7 Wellness, any counts less than 5 are suppressed and reported as "n < 5". All analysis was  
8 performed using SPSS Version 24 (Armonk, NY: IBM Corp).<sup>18</sup>  
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## 19 **Results**

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22 A total of 7140 patients were eligible, the majority of whom were trauma patients (Figure  
23 1). After excluding patients who survived to hospital discharge, 940 patients remained for  
24 analysis. This included 581 trauma records from the NSTR, 251 non-trauma records from the  
25 LLDR, and 108 trauma patients with a record in both the NSTR and LLDR.  
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31 Of all trauma-related in-hospital deaths, 40% (274/689) met the NSTR definition of a  
32 POD. Table 1 compares characteristics of trauma patients who were PODs or non-PODs.  
33 Potential donors were younger and more likely to be male. The groups differed in injury types,  
34 causes of injury, ICD-10-CA injury codes, and number of intermediate facilities. The POD group  
35 tended to be more severely injured as demonstrated by higher mean ISS scores, higher mean AIS  
36 Head scores, and lower mean scene GCS scores compared to the non-POD group. A greater  
37 proportion of patients in the POD group required resuscitation by the Trauma Nova Scotia trauma  
38 team, were transported to the final institution by air, and required ICU admission.  
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50 Organ donation by trauma and non-trauma patients is compared in Table 2. Overall, there  
51 were 359 PODs in the LLDR (108 trauma, 251 non-trauma). The conversion rate during the study  
52 period was 84% (48/57) for trauma patients and 84% (81/97) for non-trauma patients. Consent  
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3 rates were 69% (57/83) and 66% (97/148) in trauma and non-trauma patients, respectively.  
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5 Trauma donors were younger than non-trauma donors and more likely to be male. Most donors  
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7 were NDD (trauma 83%; non-trauma 84%). Nearly half of donors had signed their MSI card, with  
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9 most indicating their intent to donate all organs (Donor 1). Overall, trauma patients donated 203  
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11 organs (4.23 organs/donor) and non-trauma patients donated 335 organs (4.14 organs/donor).  
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13 Organ types procured most frequently were kidney and liver from trauma patients, and kidney and  
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15 lung from non-trauma patients. The number of organs per donor was higher in NDD (4.55  
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17 organs/donor) compared to DCD (2.47 organs/donor). Figure 2 shows conversion rates and the  
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19 number of PODs during each fiscal year for trauma and non-trauma patients in the LLDR. Non-  
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21 trauma PODs outnumbered trauma PODs each year, yet no clear trend in conversion rates was  
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23 observable.  
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29 Among trauma patients referred to the Legacy of Life Program, the most common reasons  
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31 for non-donation were refusal of consent by the family and medical unsuitability (Table 3).  
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33 Families of trauma PODs refused consent more often than those of non-trauma PODs. In non-  
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35 trauma patients, medical unsuitability and family refusal of consent were the most common  
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37 reasons for non-donation. Of those deemed medically unsuitable, 21 patients (7 trauma, 14 non-  
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39 trauma) were DCD eligible but did not die within 2 hours following withdrawal of life support.  
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41 Among the 359 trauma and non-trauma PODs, 37% (133/359) indicated their intent to donate by  
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43 signing their MSI card. Of these 133 willing patients, 61 (22 trauma; 39 non-trauma) became  
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45 actual donors. The remaining 72 willing patients did not donate due to medical unsuitability (n =  
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47 40; 56%), missed referral (n = 21; 29%), or family refusal of consent (n = 14; 20%) (in 3 cases,  
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49 patient was medically unsuitable and family refused consent).  
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## Discussion

In this retrospective evaluation of OD in Nova Scotia, trauma victims accounted for over one third of organ donors in the province. Of all trauma-related deaths in provincial hospitals, 40% were identified as PODs and 7% successfully donated organs (most as NDD donors). Trauma victims who were PODs tended to be more severely injured compared to those who were non-PODs. Despite having an 84% conversion rate in both trauma and non-trauma patients, the majority of PODs did not successfully donate organs. Our findings demonstrate that trauma patients represent a significant pool of PODs and that increased efforts should be considered to improve the number of donors from this population.

Family refusal of consent was the most common reason for failure to procure organs following traumatic injury, which is consistent with reports from the United States,<sup>5,19</sup> Mexico,<sup>20</sup> and the Netherlands.<sup>6</sup> Among non-trauma PODs, medical unsuitability was the main reason for non-donation, followed by refusal of consent by the family. We found 37% of all PODs in the LLDR had signed their MSI card indicating their intent to donate, yet the majority of these willing patients did not become donors. While most did not donate due to medical unsuitability or missed referral, 20% of these patients ultimately failed to donate because their families overrode their desire and refused to provide consent. In 2010, the Government of Nova Scotia passed the Human Organ and Tissue Donation Act declaring that any capable individual may, in a writing signed by the individual, consent to donate specific organs or tissues from their living body, and that such consent was binding; however, this act has yet to be proclaimed.<sup>21</sup> Only one third of residents in most Canadian provinces have registered their intention to donate.<sup>2</sup> While intent-to-donate registries may provide a formal report of the patient's wishes, family members have the ability to override the potential donor's wishes.<sup>2</sup> In Nova Scotia, 54% of residents have registered their

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3 intent to donate which is the highest rate in the country. There is evidence that families are more  
4 likely to consent if they have more contact with OPOs and discussions surrounding OD.<sup>22</sup>  
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8 Physicians play important roles in the recognition and referral of PODs to their OPO.  
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10 Increased education on the local OD criteria and processes at their institution will help physicians  
11 identify potential donors. Furthermore, physicians must minimize instability in PODs to maintain  
12 organ viability for donation. While our study found trauma PODs were more severely injured than  
13 non-PODs, it is challenging to identify these patients until they are stabilized. Accordingly,  
14 immediate resuscitation is paramount in all trauma patients. Overall, we believe improved  
15 strategies are required to enhance recognition of trauma PODs, increase donations made by DCD,  
16 and improve consent rates following end-of-life conversations with the family. As well, thanks to  
17 early work led by the emergency medicine community utilizing expanded CPR (eCPR),  
18 aggressive resuscitation of patients in cardiac arrest has increased survival of out-of-hospital  
19 cardiac arrest patients.<sup>7,23</sup> Some of these patients initially resuscitated using eCPR do ultimately  
20 succumb to anoxic brain injury and thus should be assessed for donation potential.  
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35 This study has several limitations. Data were collected from a provincial population-based  
36 trauma registry and a provincial OPO; thus, our findings are susceptible to known limitations of  
37 retrospective data collection. Another limitation is the criteria used to identify PODs in the NSTR.  
38 While the CBS Deceased Donor Data Working Group recommended ventilation within 24 hours  
39 of death as a criterion,<sup>21</sup> the NSTR only captures whether a patient required ventilation at any  
40 time during hospital stay. Therefore, we may have overestimated the number of trauma PODs in  
41 the NSTR. Since criteria for referral to the Legacy of Life Program are different from the criteria  
42 for eligibility, it is unclear whether missed referrals were PODs. Finally, our results may not be  
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3 generalizable to other regions or institutions that differ in their definition of a trauma patient or  
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5 their criteria and processes for OD.  
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8 In summary, we found 40% of trauma patients who died in Nova Scotia hospitals were  
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10 PODs. Among trauma patients referred to the provincial OPO, 44% successfully donated their  
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12 organs. Family refusal, medical unsuitability, and missed referrals were the most common reasons  
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14 for non-donation by PODs. Further work is required to improve OD by trauma victims in Canada.  
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## 19 **Acknowledgements**

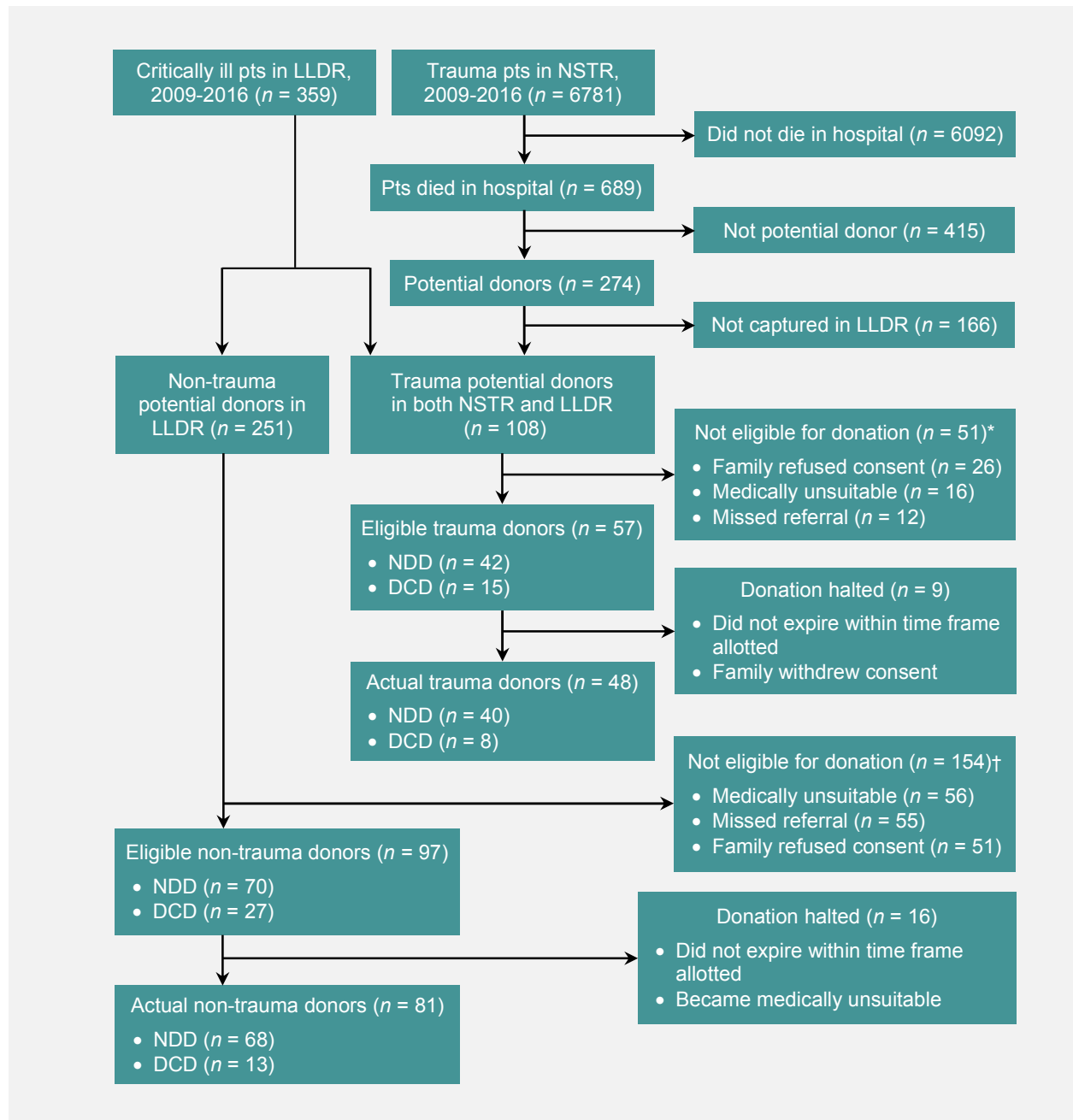
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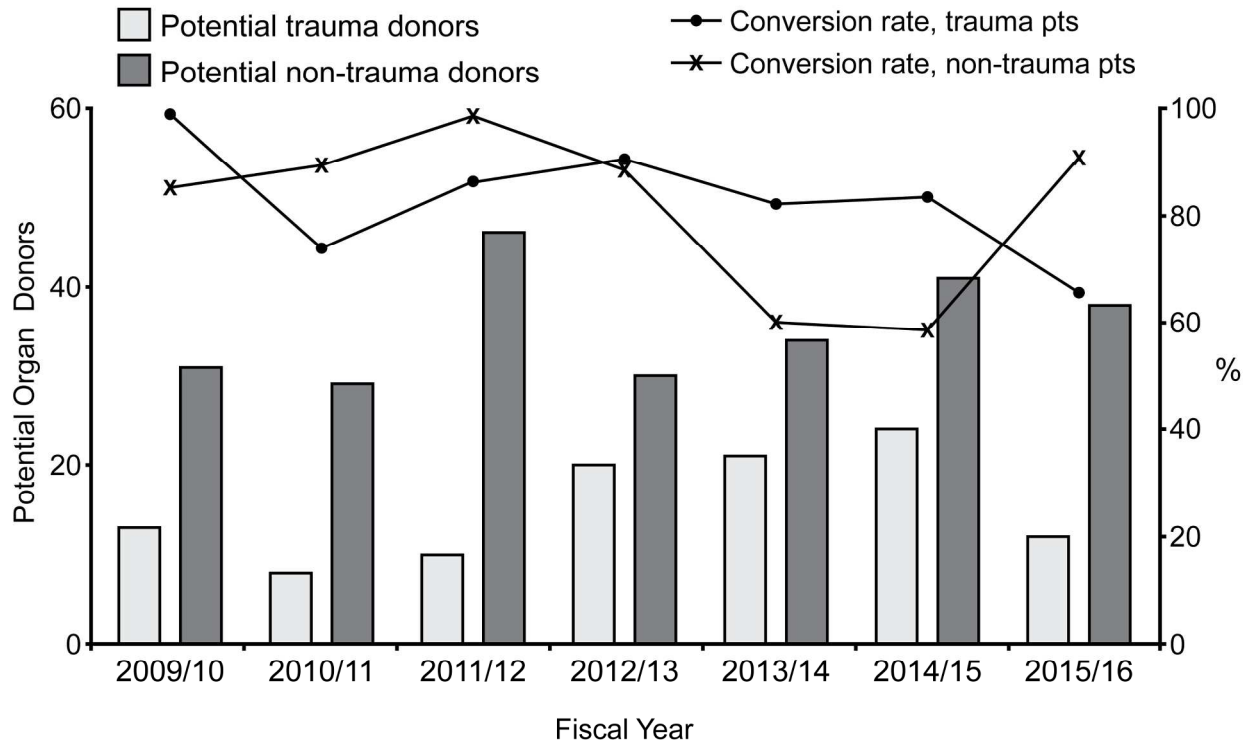
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**Figure 1:** Organ donation in Nova Scotia, 2009-2016. Note: NSTR = Nova Scotia Trauma Registry, LLDR = Legacy of Life Donor Registry, NDD = Neurological determination of death, DCD = Donation after circulatory death. A potential donor in the NSTR was defined as a trauma patient who died in hospital, had an appropriate ICD-10-CA injury code (see Appendix A), and received mechanical ventilation during their hospital stay. The LLDR definition of a potential organ donor was a patient who met the following four criteria: 1) GCS  $\geq$  5T (2009-2013) or grave prognosis or GCS  $\geq$  5T (2014-2016); 2) irreversible brain injury (2009-2013) or injured brain or non-recoverable injury or illness (2014-2016); 3) patient intubated and ventilator-dependent; and 4) end of life discussion held with family and decision made to withdraw life sustaining therapy. \*3 patients were ineligible for more than 1 reason; †8 patients were ineligible for more than 1 reason.



**Figure 2:** Trends in number of potential organ donors and conversion rates by fiscal year. Conversion rate was defined as proportion of eligible donors who became actual donors. Criteria for a potential donor was a patient who met the following four criteria: 1) GCS  $\geq$  5T (2009-2013) or grave prognosis or GCS  $\geq$  5T (2014-2016); 2) irreversible brain injury (2009-2013) or injured brain or non-recoverable injury or illness (2014-2016); 3) patient intubated and ventilator-dependent; and 4) end of life discussion held with family and decision made to withdraw life sustaining therapy.



**Table 1: Characteristics of trauma patients who died in hospital and were or were not potential organ donors\***

Characteristic	PODs <i>n</i> = 274	Non-PODs <i>n</i> = 415	<i>p</i> -value
Age, mean (SD)	55.6 ± 23.5	71.9 ± 20.9	<0.001
Gender, male, <i>n</i> (%)	196 (72)	265 (64)	0.036
<b>Residence</b>			0.37
Urban	186 (68)	290 (70)	
Rural	84 (31)	123 (29)	
Missing	<i>n</i> < 5	<i>n</i> < 5	
<b>Injury location, <i>n</i> (%)</b>			0.39
Within HRM	93 (34)	150 (36)	
Outside of HRM	158 (58)	241 (58)	
Missing	23 (8)	24 (6)	
<b>Intermediate facilities, <i>n</i> (%)</b>			<0.001
0	145 (53)	283 (68)	
1	115 (42)	81 (20)	
2 or more	14 (5)	29 (7)	
Missing	0 (0)	22 (5)	
<b>Injury type, <i>n</i> (%)</b>			<0.001
Blunt	242 (88)	334 (80)	
Drowning/asphyxia	23 (8)	21 (5)	
Other†	9 (4)	60 (15)	
<b>Cause of injury, <i>n</i> (%)</b>			<0.001
Falls	116 (42)	247 (60)	
Motor vehicle collision	75 (27)	50 (12)	
Self-harm	29 (11)	17 (4)	
Other	54 (20)	101 (24)	
<b>ICD-10-CA injury code,‡ <i>n</i> (%)</b>			<0.001
Traumatic SDH	192 (70)	153 (37)	
Traumatic SAH	154 (56)	85 (20)	
Focal brain injury	117 (43)	44 (11)	
Fracture, base of skull	101 (37)	20 (5)	
Fracture, vault of skull	70 (26)	23 (6)	
Traumatic cerebral edema	59 (22)	14 (3)	
Diffuse brain injury	52 (19)	<i>n</i> < 5	
Other	116 (42)	89 (21)	
<b>Comorbidities,§ <i>n</i> (%)</b>			0.30
Cardiac/vascular	58 (21)	98 (24)	
Neurological	25 (9)	32 (8)	
Respiratory	7 (3)	18 (4)	
Neoplastic	5 (2)	18 (4)	

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4	Infectious disease	n < 5	12 (3)	
5	Renal	n < 5	10 (2)	
6	Gastrointestinal	n < 5	6 (1)	
7	Other	38 (14)	59 (14)	
8	<b>Injury severity</b>			
9				
10	ISS, mean (SD)	28.5 ± 12.1	20.7 ± 11.0	<0.001
11	AIS Head, mean (SD)	4.5 ± 0.7	3.9 ± 1.3	<0.001
12	Scene GCS, mean (SD)	6.9 ± 4.6	11.0 ± 4.9	<0.001
13	<b>Trauma team activation, n (%)</b>	111 (41)	55 (13)	<0.001
14				
15	<b>Transport to final institution, n (%)</b>			<0.001
16	Land	194 (71)	359 (86)	
17	Air†	53 (19)	13 (3)	
18	Both land and air	22 (8)	12 (3)	
19	Other**	n < 5	12 (3)	
20	Missing	n < 5	19 (5)	
21				
22	<b>Hospital stay</b>			
23				
24	ICU admission, n (%)	183 (67)	76 (18)	<0.001
25	ICU LOS - days, mean (SD)	4.4 ± 5.2	4.7 ± 7.3	0.72
26	In-hospital LOS - days, mean (SD)	7.0 ± 27.8	9.3 ± 21.1	0.22
27	Ventilator days, mean (SD)	2.9 ± 3.6	3.4 ± 5.2	0.29
28				
29	<b>Institution where patient died, n (%)</b>			<0.001
30	QEII HSC	214 (78)	211 (51)	
31	Other	60 (22)	204 (49)	
32				
33	Note: POD = potential organ donor, SD = standard deviation, HRM = Halifax Regional Municipality, ICD-10-CA = International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada, SDH = subdural hemorrhage, SAH = subarachnoid hemorrhage, ISS = Injury Severity Score, AIS = Abbreviated Injury Scale, GCS = Glasgow Coma Scale, ICU = intensive care unit, LOS = length of stay, QEII HSC = Queen Elizabeth II Health Sciences Centre.			
34	*Based on the NSTR definition of a POD being a trauma patient who died in hospital, had an appropriate ICD-10-CA injury code (see Appendix A), and received mechanical ventilation during their hospital stay.			
35	†Other injury types included penetrating injuries and burns.			
36	‡ICD-10-CA codes from NSTR definition of a POD (Appendix A). Some patients had multiple injury codes.			
37	§Some patients had multiple comorbidities			
38	¶Air includes both helicopter and fixed-wing aircraft.			
39	**Other transport modes included private vehicle and walk in.			
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**Table 2: Organ donation by deceased trauma and non-trauma patients**

Variable	Trauma donors <i>n</i> = 48	Non-trauma donors <i>n</i> = 81	<i>p</i> -value
Conversion rate*	84%	84%	0.91
Consent rate†	69%	66%	0.63
Age, mean (SD)	39.7 ± 20.5	49.1 ± 14.0	0.002
Gender, male, <i>n</i> (%)	34 (71)	38 (47)	0.008
<b>Type of donor, <i>n</i> (%)</b>			0.93
NDD	40 (83)	68 (84)	
DCD	8 (17)	13 (16)	
<b>MSI card signed, <i>n</i> (%)</b>			0.75
Yes	22 (46)	39 (49)	
No	20 (42)	29 (35)	
Unknown	6 (12)	13 (16)	
<b>MSI donor classification,‡ <i>n</i> (%)</b>			0.75
Donor 1	18 (38)	31 (38)	
Donor 2	5 (10)	8 (10)	
Missing	25 (52)	42 (52)	
<b>Organs donated</b>	203	335	
<b>Organs per donor</b>	4.23	4.14	
<b>Organ types donated</b>			
Kidney	91	153	
Liver	37	58	
Lung	32	71	
Pancreas	23	32	
Heart	20	21	

Note: SD = standard deviation, NDD = Neurological determination of death, DCD = Donation after circulatory death, MSI = Medical Services Insurance.

\*Percentage of eligible donors who became actual donors.

†Percentage of eligible PODs (or their families) approached for consent who gave consent to become a donor.

‡Patient indicated their intent to donate all organs (Donor 1) or specific organs (Donor 2).

**Table 3: Reasons for non-donation in potential organ donors who were or were not referred to the Legacy of Life Program**

Reason*	Trauma PODs <i>n</i> = 60	Non-trauma PODs <i>n</i> = 170	<i>p</i> -value
<b>Medically unsuitable, <i>n</i> (%)</b>	23 (38)	70 (41)	0.70
Not declarable	9 (15)	26 (15)	0.96
Age†	7 (12)	22 (13)	0.80
Did not expire within time frame allotted‡	7 (12)	14 (8)	0.43
Others§	5 (8)	27 (16)	0.15
Unknown	<i>n</i> < 5	7 (4)	0.79
<b>Family refused consent, <i>n</i> (%)</b>	28 (46)	51 (30)	0.019
Wait time for donation process	11 (18)	8 (5)	<0.001
Family belief	8 (13)	14 (8)	0.25
Unknown	9 (15)	26 (15)	0.95
<b>Missed referral</b>	12 (20)	55 (32)	0.07
Medically unsuitable	6 (10)	29 (17)	0.19
Family refused consent or was not approached	<i>n</i> < 5	0 (0)	0.09
Unknown	5 (8)	26 (15)	0.17

Note: POD = potential organ donor.  
 \*Some patients did not become organ donors for more than 1 reason.  
 †Age limit for DCD was <55 years prior to June 2010 and <65 years after June 2010.  
 ‡Time frame was 2 hours following withdrawal of life support.  
 §Other reasons included cancer, multi-organ failure, hepatitis, sepsis, and renal failure.

## Appendix A

The NSTR definition of a potential organ donor was any trauma patient in the NSTR who died in hospital and met the two criteria listed below:

1. Had at least one of the following ICD-10-CA injury codes:
  - a. S06 - Intracranial injury
  - b. S07 - Crushing injury of head
  - c. S08 - Traumatic amputation of part of head
  - d. S09 - Other and unspecified injuries of the head
  - e. S02.0 - Fracture of vault of skull
  - f. S02.1 - Fracture of base of skull
  - g. S02.7 - Multiple fractures involving skull and facial bones
  - h. S02.89 - Fractures of other unspecified skull and facial bones
  - i. T71 - Asphyxiation (Note: use of this code in the NSTR began in April 2011)
2. Received mechanical ventilation at any time during hospital stay.