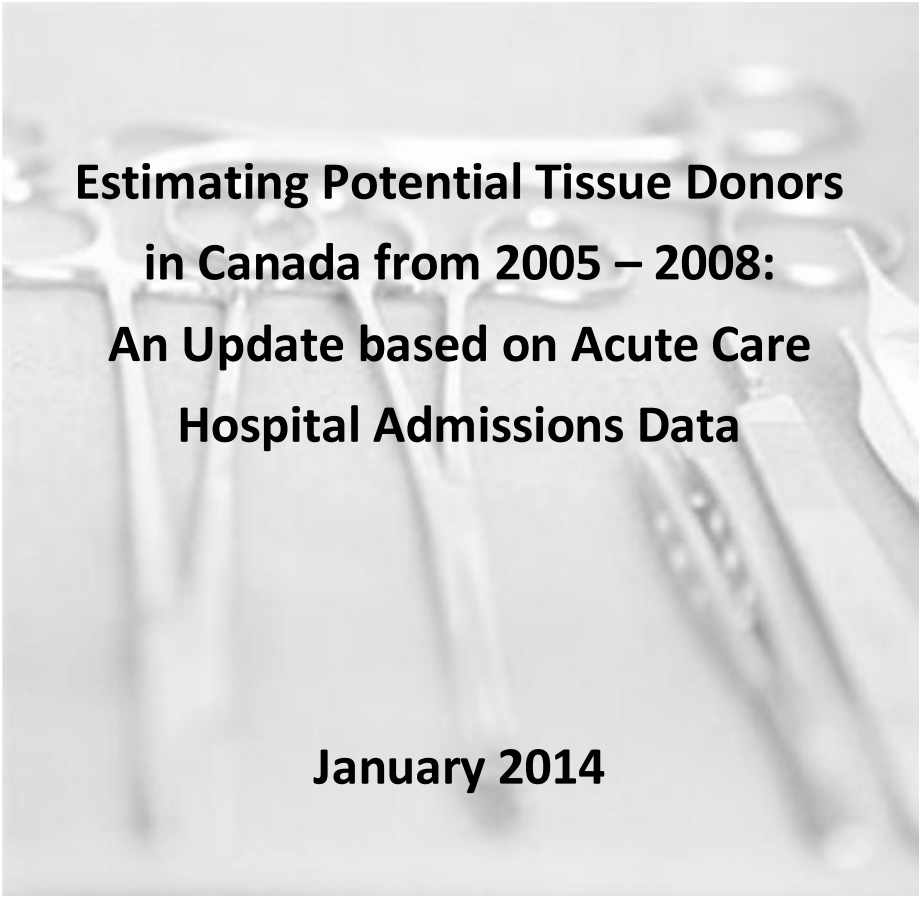
Canadian Blood Services
it's in you to give



Estimating Potential Tissue Donors in Canada from 2005 – 2008: An Update based on Acute Care Hospital Admissions Data

January 2014

Production of this advice/report has been made possible in part through a financial contribution from Health Canada.

Table of Contents

Acknowledgements

The Canadian Blood Services project team would like to gratefully acknowledge the significant contributions of its Steering Committee to the planning, implementation and completion of the CBS report, *Estimating Potential Tissue Donors in Canada from 2005 – 2008: An Update based on Acute Care Hospital Admissions Data.*

The CBS team would like to thank Claire Marie Fortin, Francine Anne Roy, and Bob Williams (Canadian Institute for Health Information) for their expertise and support of this project.

This report was prepared under the direction of Kimberly Young, Executive Director of Organs and Tissues at Canadian Blood Services (CBS). The project team included Tracy Brand, Bryan Sandilands, Mathias Haun, Jim Mohr, Christina Parsons and Rick Trifunov.

All questions regarding this report should be directed to:

Christina Parsons
Program Manager
Canadian Blood Services
8249 - 114 Street,
Edmonton, AB T6G 2R8
E-mail: Christina.parsons@blood.ca

Executive Summary

In 2004, the Canadian Council for Donation and Transplantation (CCDT) contracted the Canadian Institute for Health Information (CIHI) to develop the report, *Estimating potential tissue donors in Canada from 1995-2000: An exploratory analysis based on acute care hospital admissions data.* This report estimates the number of potential tissue donors in Canada, given a series of set parameters and demographics. Estimated potential tissue donor rates provide targets by which system performance can be evaluated. Using new discharge data from 2005 to 2008, the 2004 CIHI report has been updated to reflect more recent information from the CIHI Hospital Morbidity Database (HMDB) and changes in tissue donor criteria.

In the 2004 paper, *Potential Tissue Donors* refer to patients identified as medically eligible to donate tissues based on the admitting diagnoses during the hospitalization in which they died. For the basis of this update, this definition will remain the same. As with the original study, deaths among patients admitted to acute care hospitals still account for approximately half of all deaths in Canada. The potential for tissue donation is defined on the basis of tissue type. The methodology and inclusion-exclusion criteria used to determine the numbers of potential cornea, skin, bone, tendon, paediatric cardiac and adult cardiac donors are the same as those used in the 2004 report. The only exclusion criteria added for the purposes of this update are West Nile Virus (WNV) and Chagas' Disease.

Age criteria for bone, tendon and skin have been adjusted to better reflect practices within the Canadian tissue community. Age criteria for cardiac have now been detailed for both pediatric and adult populations to provide greater insight into this donor population. Age criteria are defined in Appendix B.

Consistent with the original report, more than half of all death discharges within acute care hospitals had one or more diagnoses included in the general exclusions. Differences between this update and the 2004 report in the proportions of general exclusion diagnoses among provinces have been noted. Differences may be due to coding practices, demographics and/or population health factors and fall outside the scope of the original review and this update.

This update focuses on cornea donors rather than ocular (cornea and sclera) donors as there is a significant disparity between demand and supply for corneas in Canada. Cornea donors are estimated to range from 9,039 to 36,266 donors, for a minimum yield of 18,078 corneas (using Strict Criteria, as defined in Appendix B and assuming 2 corneas per donor). Skin donors are estimated to range from 3,818 to 17,279, bone donors from 3,778 to 16,939, and tendon donors from 1,458 to 5,446. Paediatric cardiac tissue donors range from 1,208 to 1,255; however, this is based on Loose to Mid-Range Criteria as Strict Criteria data was unavailable at the time of this review due to changes in coding practices. Adult cardiac tissue donors range from 2.066 to 2,884 and the same Strict Criteria caveat applies.

As with the original report, findings indicate there are more than enough potential donors to meet the tissue needs in Canada, if appropriate infrastructure was in place to identify potential donors, to recover and to process tissue.

Introduction

In August 2008, Canadian Blood Services was mandated by the federal, provincial and territorial governments to work with the Organ and Tissue Donation and Transplantation community to design a system to improve the performance of organ and tissue donation and transplantation in Canada. While demand for transplantable tissue in Canada increases, concerns have emerged regarding the availability of an adequate domestic supply. These concerns have deliberate implications to strategic quality improvements that may be made to the overall system. The purpose of this report is to provide a current estimation of tissue donor potential for Canada for the period of 2005-2008. It is an update of the original 2004 study, *Estimating potential tissue donors in Canada from 1995-2000: An exploratory analysis based on acute care hospital admissions data*, commissioned by the Canadian Council for Donation and Transplantation (CCDT) and conducted by the Canadian Institute for Health Information (CIHI).

Building on the original study, this report helps to establish some quantitative estimates of potential tissue donors from Canadian acute care hospitals. Excluded are those who died on arrival to or in emergency departments as well as those who died in long-term care facilities or other non-hospital facilities, including private residences. *Potential tissue donors* in this report refers to patients who were identified as medically eligible to donate based on their diagnoses during their final acute care hospitalizations, not taking into consideration issues surrounding consent.

Validating the findings of the 2004 report, the purpose of this update is to estimate the number of potential tissue donors in Canada, given a series of set parameters and demographics. The intention is to be able to set reasonable donation targets, given a broad set of assumptions, for tissue recovery agencies and their stakeholders to work towards. Estimated potential tissue donor rates provide targets by which system performance can be evaluated. Using new discharge data from 2005 to 2008, the 2004 CIHI report has been updated to reflect more recent information from the CIHI Hospital Morbidity Database (HMDB) and changes in tissue donor criteria. This report enhances the methodology used in the 2004 CIHI report by focusing on those tissues which are in the highest demand; corneas and paediatric cardiac tissue.

Findings

The findings are presented according to tissue type. Detailed provincial data are provided in Appendix A.

Ocular: Cornea

A subset of the general tissue donation exclusions along with additional tissue-specific exclusions was applied to derive the estimates of potential cornea donors. These exclusions are consistent with the original 2004 CIHI Report, with the additions of West Nile Virus (WNV) and Chagas' Disease. The Loose Criteria has been updated to include only patients from the ages of two (2) to eighty (80) years, adjusted from the 2004 criteria of eighteen (18) months to eighty (80) years of age (see Appendix B).

Loose Criteria

- Criteria included patients from the ages of two (2) years to eighty (80) years. Within this range, from 2005 to 2008, an average of 48,530 patients died each year in Canada.
- 12,264 patients were excluded because of disease conditions that precluded corneal donation.
- From 2005 to 2008, there was an annual average of 36,266 potential cornea donors, which represents 43.2% of all acute care hospital deaths.

Mid-Range Criteria

- Criteria included patients from the ages of two (2) years to seventy (70) years. Within this range, from 2005 to 2008, an average of 25,465 patients died each year in Canada.
- 6,632 patients were excluded because of disease conditions that precluded corneal donation.
- From 2005 to 2008, there was an annual average of 18,833 potential cornea donors, which represents 22.4% of all acute care hospital deaths.

Strict Criteria

- Criteria included patients from the ages of two (2) years to sixty (60) years. Within this range, from 2005 to 2008, an average of 12,567 patients died each year in Canada.
- 3,528 patients were excluded because of disease conditions that precluded corneal donation.
- From 2005 to 2008, there was an annual average of 9,039 potential cornea donors, which represents 10.8% of all acute care hospital deaths.

Table 1. Cornea: Estimated Potential Donors, Canada, 2005-2008

	Number of Patient Deaths (%)*
All Acute Care Hospital Patient Deaths	83,948 (100)
Included Deaths based on age range:	
• Loose Criteria (2yrs – 80yrs)	48,530 (57.8)
• Mid-Range Criteria (2yrs – 70yrs)	25,465 (30.3)
• Strict Criteria (2yrs – 60yrs)	12,567 (15.1)
Estimated Potential Donors (age inclusions without diagnostic exclusions):	
• Loose Criteria	36,266 (43.2)
• Mid-Range Criteria	18,833 (22.4)
• Strict Criteria	9,039 (10.8)

**Based on a four-year average.*

Skin

A subset of the general tissue donation exclusions along with additional tissue-specific exclusions was applied to derive the estimates of potential skin donors. These exclusions are consistent with the original 2004 CIHI Report, with the additions of West Nile Virus (WNV) and Chagas' Disease. The Age Criteria, however, have been adjusted (see Appendix B). Loose Criteria now includes patients aged fifteen (15) to eighty (80) years, a change from twelve (12) to eighty-five (85) years (2004). Mid-Range Criteria includes fifteen (15) to seventy (70) years, a change from sixteen (16) to sixty-five (65) years (2004). Strict Criteria includes fifteen (15) to sixty (60) years, a change from sixteen (16) to fifty (50) years (2004).

Loose Criteria

- Criteria included patients from the ages of fifteen (15) years to eighty (80) years. Within this range, from 2005 to 2008, an average of 48,340 patients died each year in Canada.
- 31,061 patients were excluded because of disease conditions that precluded skin donation.
- From 2005 to 2008, there was an annual average of 17,279 potential skin donors, which represents 20.6% of all acute care hospital deaths.

Mid-Range Criteria

- Criteria included patients from the ages of fifteen (15) years to seventy (70) years. Within this range, from 2005 to 2008, an average of 25,274 patients died each year in Canada.
- 7,865 patients were excluded because of disease conditions that precluded skin donation.
- From 2005 to 2008, there was an annual average of 7,865 potential skin donors, which represents 9.4% of all acute care hospital deaths.

Strict Criteria

- Criteria included patients from the ages of fifteen (15) years to sixty (60) years. Within this range, from 2005 to 2008, an average of 12,377 patients died each year in Canada.
- 3,818 patients were excluded because of disease conditions that precluded skin donation.
- From 2005 to 2008, there was an annual average of 3,818 potential skin donors, which represents 4.5% of all acute care hospital deaths.

Table 2. Skin: Estimated Potential Donors, Canada, 2005-2008

	Number of Patient Deaths (%)*
All Acute Care Hospital Patient Deaths	83,948 (100)
Included Deaths based on age range:	
• Loose Criteria (15yrs – 80yrs)	48,340 (57.6)
• Mid-Range Criteria (15yrs – 70yrs)	25,274 (30.1)
• Strict Criteria (15yrs – 60yrs)	12,377 (14.7)
Estimated Potential Donors (age inclusions without diagnostic exclusions):	
• Loose Criteria	17,279 (20.6)
• Mid-Range Criteria	7,865 (9.4)
• Strict Criteria	3,818 (4.5)

**Based on a four-year average.*

Musculoskeletal: Bone

A subset of the general tissue donation exclusions along with additional tissue-specific exclusions was applied to derive the estimates of potential bone donors. These exclusions are consistent with the original 2004 CIHI Report, with the additions of WNV and Chagas' Disease. The Age Criteria, however, have been adjusted (see Appendix B). Loose Criteria now includes patients aged fifteen (15) to eighty (80) years, a change from twelve (12) to eighty-five (85) years (2004). Mid-Range Criteria includes fifteen (15) to seventy (70) years, a change from sixteen (16) to sixty-five (65) years (2004). Strict Criteria includes fifteen (15) to sixty (60), a change from sixteen (16) to fifty (50) years (2004).

Loose Criteria

- Criteria included patients from the ages of fifteen (15) years to eighty (80) years. Within this range, from 2005 to 2008, an average of 48,340 patients died each year in Canada.
- 16,939 patients were excluded because of disease conditions that precluded bone donation.
- From 2005 to 2008, there was an annual average of 16,939 potential bone donors, which represents 20.2% of all acute care hospital deaths.

Mid-Range Criteria

- Criteria included patients from the ages of fifteen (15) years to seventy (70) years. Within this range, from 2005 to 2008, an average of 25,274 patients died each year in Canada.
- 7,739 patients were excluded because of disease conditions that precluded bone donation.
- From 2005 to 2008, there was an annual average of 7,739 potential bone donors, which represents 9.2% of all acute care hospital deaths.

Strict Criteria

- Criteria included patients from the ages of fifteen (15) years to sixty (60) years. Within this range, from 2005 to 2008, an average of 12,377 patients died each year in Canada.
- 3,778 patients were excluded because of disease conditions that precluded bone donation.
- From 2005 to 2008, there was an annual average of 3,778 potential bone donors, which represents 4.5% of all acute care hospital deaths.

Table 3. Bone: Estimated Potential Donors, Canada, 2005-2008

	Number of Patient Deaths (%)*
All Acute Care Hospital Patient Deaths	83,948 (100)
Included Deaths based on age range:	
• Loose Criteria (15yrs – 80yrs)	48,340 (57.6)
• Mid-Range Criteria (15yrs – 70yrs)	25,274 (30.1)
• Strict Criteria (15yrs – 60yrs)	12,377 (14.7)
Estimated Potential Donors (age inclusions without diagnostic exclusions):	
• Loose Criteria	16,939 (20.2)
• Mid-Range Criteria	7,739 (9.2)
• Strict Criteria	3,778 (4.5)

**Based on a four-year average.*

Musculoskeletal: Tendon

A subset of the general tissue donation exclusions along with additional tissue-specific exclusions was applied to derive the estimates of potential tendon donors, consistent with the original 2004 CIHI Report, with the additions of WNV and Chagas' Disease. The Age Criteria, however, have been adjusted (see Appendix B). Loose Criteria now includes patients aged fifteen (15) to sixty-five (65) years, a change from fifteen (15) to sixty (60) years (2004). Mid-Range Criteria includes fifteen (15) to sixty (60) years, a change from fifteen (15) to fifty (50) years (2004). Strict Criteria includes fifteen (15) to fifty (50), a change from twelve (12) to forty-five (45) years (2004).

Loose Criteria

- Criteria included patients from the ages of fifteen (15) years to sixty-five (65) years. Within this range, from 2005 to 2008, an average of 17,986 patients died each year in Canada.
- 12,540 patients were excluded because of disease conditions that precluded tendon donation.
- From 2005 to 2008, there was an annual average of 5,446 potential tendon donors, which represents 6.5% of all acute care hospital deaths.

Mid-Range Criteria

- Criteria included patients from the ages of fifteen (15) years to sixty (60) years. Within this range, from 2005 to 2008, an average of 12,377 patients died each year in Canada.
- 8,571 patients were excluded because of disease conditions that precluded tendon donation.
- From 2005 to 2008, there was an annual average of 3,806 potential tendon donors, which represents 4.5% of all acute care hospital deaths.

Strict Criteria

- Criteria included patients from the ages of fifteen (15) years to fifty (50) years. Within this range, from 2005 to 2008, an average of 4,924 patients died each year in Canada.
- 3,466 patients were excluded because of disease conditions that precluded tendon donation.
- From 2005 to 2008, there was an annual average of 1,458 potential tendon donors, which represents 1.7% of all acute care hospital deaths.

Table 4. Tendon: Estimated Potential Donors, Canada, 2005-2008

	Number of Patient Deaths (%)*
All Acute Care Hospital Patient Deaths	83,948 (100)
Included Deaths based on age range:	
• Loose Criteria (15yrs – 65yrs)	17,986 (21.4)
• Mid-Range Criteria (15yrs – 60yrs)	12,377 (14.7)
• Strict Criteria (15yrs – 50yrs)	4,924 (5.9)
Estimated Potential Donors (age inclusions without diagnostic exclusions):	
• Loose Criteria	5,446 (6.5)
• Mid-Range Criteria	3,806 (4.5)
• Strict Criteria	1,458 (1.7)

**Based on a four-year average.*

Cardiac: Paediatric

A subset of the general tissue donation exclusions along with additional tissue-specific exclusions was applied to derive the estimates of potential paediatric cardiac tissue donors, consistent with the original 2004 CIHI Report, with the additional exclusions of WNV and Chagas' Disease. Originally, cardiac potentials were separated into heart valves, femoral vein and saphenous vein donations. Current data does not include vascular tissue; rather, potential cardiac tissue donations are consolidated and reported by the age of the donor (paediatric or adult). The Age Criteria have also been adjusted (see Appendix B) to differentiate adult from paediatric donors. Loose Criteria includes patients from newborn (0) to fifteen (15) years. Mid-Range Criteria includes newborn (0) to ten (10) years and Strict Criteria includes newborn (0) to five (5) years.

Loose Criteria

- Criteria included patients from newborn (0) years to fifteen (15) years. Within this range, from 2005 to 2008, an average of 1,499 patients died each year in Canada.
- 244 patients were excluded because of disease conditions that precluded cardiac tissue donation.
- From 2005 to 2008, there was an annual average of 1,255 potential paediatric cardiac tissue donors, which represents 1.5% of all acute care hospital deaths.

Mid-Range Criteria

- Criteria included patients from newborn (0) to ten (10) years. Within this range, from 2005 to 2008, an average of 1,412 patients died each year in Canada.
- 204 patients were excluded because of disease conditions that precluded cardiac tissue donation.
- From 2005 to 2008, there was an annual average of 1,208 potential paediatric cardiac tissue donors, which represents 1.4% of all acute care hospital deaths.

Strict Criteria

- Criteria included patients from newborn (0) to five (5) years.
- Data for age inclusions without diagnostic exclusions within the Strict Criteria are unavailable due to inability to cross-reference changes in code nomenclature from ICD-9 to ICD-10.

Table 5. Cardiac, Paediatric: Estimated Potential Donors, Canada, 2005-2008

	Number of Patient Deaths (%)*
All Acute Care Hospital Patient Deaths	83,948 (100)
Included Deaths based on age range:	
• Loose Criteria (Newborn – 15yrs)	1,499 (1.8)
• Mid-Range Criteria (Newborn – 10yrs)	1,412 (1.7)
• Strict Criteria (Newborn – 5yrs)	1,353 (1.6)
Estimated Potential Donors (age inclusions without diagnostic exclusions):	
• Loose Criteria	1,255 (1.5)
• Mid-Range Criteria	1,208 (1.4)
• Strict Criteria	Data Unavailable

**Based on a four-year average.*

Cardiac: Adult

A subset of the general tissue donation exclusions along with additional tissue-specific exclusions was applied to derive the estimates of potential adult cardiac tissue donors, consistent with the original 2004 CIHI Report, with the additional exclusions of WNV and Chagas' Disease. Originally, cardiac potentials were separated into heart valves, femoral vein and saphenous vein donations. Current data does not include vascular tissue; rather, potential cardiac tissue donations are consolidated and reported by the age of the donor (paediatric or adult). The Age Criteria have also been adjusted (see Appendix B) to differentiate adult from paediatric donors. Loose Criteria includes patients from sixteen (16) years to sixty (60) years. Mid-Range Criteria includes sixteen (16 years) to fifty-five (55) years and Strict Criteria includes sixteen (16) years to fifty (50) years.

Loose Criteria

- Criteria included patients from the ages of sixteen (16) years to sixty (60) years. Within this range, from 2005 to 2008, an average of 12,352 patients died each year in Canada.
- 9,468 patients were excluded because of disease conditions that precluded cardiac tissue donation.
- From 2005 to 2008, there was an annual average of 2,884 potential adult cardiac tissue donors, which represents 3.4% of all acute care hospital deaths.

Mid-Range Criteria

- Criteria included patients from the ages of sixteen (16) years to fifty-five (55) years. Within this range, from 2005 to 2008, an average of 7,948 patients died each year in Canada.
- 5,882 patients were excluded because of disease conditions that precluded cardiac tissue donation.
- From 2005 to 2008, there was an annual average of 2,066 potential adult cardiac tissue donors, which represents 2.5% of all acute care hospital deaths.

Strict Criteria

- Criteria included patients from sixteen (16) years to fifty (50) years. Within this range, from 2005 to 2008, an average of 4,898 patients died each year in Canada.
- Data for age inclusions without diagnostic exclusions within the Strict Criteria are unavailable due to inability to cross-reference changes in code nomenclature from ICD-9 to ICD-10.

Table 6. Cardiac, Adult: Estimated Potential Donors, Canada, 2005-2008

	Number of Patient Deaths (%)*
All Acute Care Hospital Patient Deaths	83,948 (100)
Included Deaths based on age range:	
• Loose Criteria (16yrs – 60yrs)	12,352 (14.7)
• Mid-Range Criteria (16yrs – 55yrs)	7,948 (9.5)
• Strict Criteria (16yrs – 50yrs)	4,898 (5.8)
Estimated Potential Donors (age inclusions without diagnostic exclusions):	
• Loose Criteria	2,884 (3.4)
• Mid-Range Criteria	2,066 (2.5)
• Strict Criteria	Data Unavailable

**Based on a four-year average.*

Provincial Variation

Table 7 presents a summary of data on estimated potential tissue donors by type and by province.

Table 7. Tissue-specific Estimates of Potential Donors, Provinces, 2005-2008

	Province*								
	BC	AB	SK	MB	ON	NB	NL	NS	PE
Acute care hospital admissions resulting in deaths	55,610	37,385	16,918	19,666	161,384	14,671	9,740	17,440	2,376
Cornea – Loose	23,888	16,189	7,347	8,526	67,916	6,631	5,176	7,941	1,073
% of all deaths	43.0	43.3	43.4	43.4	42.1	45.2	53.1	45.5	45.2
Cornea – Mid-Range	12,211	8,942	3,796	4,424	34,748	3,452	2,800	4,169	547
% of all deaths	22.0	23.9	22.4	22.5	21.5	23.5	28.7	23.9	23.0
Cornea – Strict	5,925	4,722	1,855	2,192	14,429	1,556	1,276	1,838	231
% of all deaths	10.7	12.6	11.0	11.1	10.2	10.6	13.1	10.5	9.7
Skin – Loose	12,178	7,202	3,280	3,715	33,262	3,027	2,362	3,414	520
% of all deaths	21.9	19.3	19.4	18.9	20.6	20.6	24.3	19.6	21.9
Skin – Mid-Range	5,559	3.575	1,473	1,718	14,939	1,318	1,064	1,512	214
% of all deaths	10.0	9.6	8.7	8.7	9.3	9.0	10.9	8.7	9.0
Skin – Strict	2,752	2,001	751	846	7,090	599	456	653	75
% of all deaths	4.9	5.4	4.4	4.3	4.4	4.1	4.7	3.7	3.2
Bone – Loose	11,993	6,905	3,236	3,637	32,631	3,000	2,344	3,348	515
% of all deaths	21.6	18.5	19.1	18.5	20.2	20.4	24.1	19.2	21.7
Bone – Mid-Range	5,479	3,458	1,462	1,692	14,707	1,315	1,060	1,485	212
% of all deaths	9.9	9.2	8.6	8.6	9.1	9.0	10.9	8.5	8.9
Bone – Strict	2,720	1,964	748	839	7,020	600	455	643	75
% of all deaths	4.9	5.3	4.4	4.3	4.3	4.1	4.7	3.7	3.2
Tendon – Loose	3,866	2,630	1,037	1,224	10,211	929	699	996	129
% of all deaths	7.0	7.0	6.1	6.2	6.3	6.3	7.2	5.7	5.4
Tendon – Mid-Range	2,735	1,990	754	847	7,063	601	456	650	75
% of all deaths	4.9	5.3	4.5	4.3	4.4	4.1	4.7	3.7	3.2
Tendon – Strict	1,041	902	293	328	2,610	234	162	215	28
% of all deaths	1.9	2.4	1.7	1.7	1.6	1.6	1.7	1.2	1.2
Cardiac, Paeds – Loose	519	954	259	369	2,568	99	116	111	8
% of all deaths	0.9	2.6	1.5	1.9	1.6	0.7	1.2	0.6	0.3
Cardiac, Paeds – Mid-Range	489	929	250	349	2,490	95	109	98	8
% of all deaths	0.9	2.5	1.5	1.8	1.5	0.6	1.1	0.6	0.3
Cardiac, Adult – Loose	2,182	1,566	558	577	5,278	454	346	472	60
% of all deaths	3.9	4.2	3.3	2.9	3.3	3.1	3.6	2.7	2.5
Cardiac, Adult – Mid-Range	1,540	1,205	404	419	3,759	322	234	312	40
% of all deaths	2.8	3.2	2.4	2.1	2.3	2.2	2.4	1.8	1.7

**Excluding Québec and Territories. Minimum and maximum values for proportions are noted in red and green, respectively, in the electronic version of this report.*

Discussion

Generally, in comparison with the 2004 findings, the estimated numbers of potential tissue donors in Alberta and Newfoundland and Labrador tended to represent proportionately more of provincial deaths than the other provinces, with Newfoundland and Labrador leading in corneal, skin and bone donations and Alberta in tendon and cardiac tissues. Overall, Prince Edward Island tended to have the lowest proportion of donors.

References

Canadian Institute for Health Information. (2004). Estimating potential tissue donors in Canada from 1995-2000: An exploratory analysis based on acute care hospital admissions data. CIHI.

Carrey I, Hudel Y, Salame N, Queguigner F, Maux R & Delbose B. (2000). Procurement of corneas: Analysis of inventory of hospital coordination. Prospective study at Besancon Hospital University during the course of one year. *J Fr Opthalmol*. 23(10), 996-1000.

Chopra GK, De Vincentis F, Kaufman D & Collie D. (1993). Effective corneal retrieval in a general hospital. The Royal Melbourne Hospital Eye Bank. *Aust NZJ Opthalmol*., 21(4), 251-5.

Gain P, Thuret G, Loup Pugniet JL, Rizzi P, Acquart S, Le Peiti JC & Maugery J. (2002). Obtaining cornea donation consent by telephone. *Tranplantation*, 73(6), 926-9.

Garcia-Sousa S, López-Navidid A, Caballero F, Leal J & Viedma MA. (1999). Potential cornea donors in a general hospital. *Transplantation Proceedings*, 31, 2607-2608.

Heng WJ, Stanton NL, Lytle RE, Smith AF, Rapuano CJ, Laibson PR & Cohen EJ. (2001). The effect of state legislation on eye donation. *Cornea*, 20(5), 475-9.

Long J, Walsh D, Ritchie DAW & Russell F. (2000). Corneal donation in the accident and emergency department: Observational study. *British Medical Journal*, 321, 1263-4.

Muraine M, Menguy E, Martin J, Sabatier P, Watt L & Brasseur G. (2000). The interview with the donor's family before post-mortem cornea procurement. *Cornea*, 19(1), 12-16.

Muraine M, Toubeau D, Menguy E & Brasseur G. (2002). Analysing the various obstacles to cornea post-mortem procurement. *Br J Ophthalmol*. 86(8), 864-8.

Schols JM & Berendschot-deLange DC. (1999). Tissue donation in nursing homes: A survey of the number of potential donors and the knowledge and attitude of nursing home doctors and directors. *Ned Tijdschr Geneeskd*, 143(22), 1153-7.

Siminoff LA, Arnold RM, Caplan AL, Virnig BA & Seltzer BA. (1995). Public policy government organ and tissue procurement in the United States: results from the National Organ and Tissue Procurement Study. *Annals of Internal Medicine*, 123, 10.17.

Siminoff LA, Arnold R & Miller DS. (1994). Differences in the procurement of organs and tissues by health care professionals. *Clin Transplant*, 8(5), 460-5.

Appendix A. Donor Estimate Data by Type and Province, CIHI

Cornea

Table 1a) Number (%) of patient deaths meeting age inclusion criteria - by year

	Overall	Loose (Age 2-80)	Medium (Age 2-70)	Strict (Age 2-60)
Overall	335,793	194,120 (57.8)	101,858 (30.3)	50,269 (15.0)
2005	81,575	48,186 (59.1)	24,811 (30.4)	12,232 (15.0)
2006	84,036	48,641 (57.9)	25,492 (30.3)	12,551 (14.9)
2007	84,153	48,546 (57.7)	25,625 (30.5)	12,736 (15.1)
2008	86,029	48,747 (56.7)	25,930 (30.1)	12,750 (14.8)
AB	37,385	22,354 (59.8)	12,456 (33.3)	6,692 (17.9)
BC	55,610	31,362 (56.4)	16,508 (29.7)	8,360 (15.0)
MB	19,666	11,121 (56.6)	5,820 (29.6)	2,932 (14.9)
NB	14,671	8,410 (57.3)	4,342 (29.6)	1,981 (13.5)
NL	9,740	6,150 (63.1)	3,328 (34.2)	1,537 (15.8)
NS	17,440	10,250 (58.8)	5,352 (30.7)	2,460 (14.1)
ON	161,384	93,283 (57.8)	48,170 (29.9)	23,418 (14.5)
PEI	2,376	1,348 (56.7)	700 (29.5)	285 (12.0)
SK	16,918	9,389 (55.5)	4,896 (28.9)	2,447 (14.5)

Table 1b) Number (%) of in-hospital deaths meeting age inclusion criteria, as well as medical exclusions - by year/ Province. See medical exclusions based on diagnostic codes from the Jan 2004 report.

	Overall	Loose (Age 2-80)	Medium (Age 2-70)	Strict (Age 2-60)
Overall	335,793	145,065 (43.2)	75,332 (22.4)	36,156 (10.8)
2005	81,575	36,268 (44.5)	18,433 (22.6)	8,833 (10.8)
2006	84,036	36,481 (43.4)	18,913 (22.5)	9,047 (10.8)
2007	84,153	36,209 (43.0)	18,911 (22.5)	9,172 (10.9)
2008	86,029	36,107 (42.0)	19,075 (22.2)	9,104 (10.6)
AB	37,385	16,189 (43.3)	8,942 (23.9)	4,722 (12.6)
BC	55,610	23,888 (43.0)	12,211 (22.0)	5,925 (10.7)
MB	19,666	8,526 (43.4)	4,424 (22.5)	2,192 (11.1)
NB	14,671	6,631 (45.2)	3,452 (23.5)	1,556 (10.6)
NL	9,740	5,176 (53.1)	2,800 (28.7)	1,276 (13.1)
NS	17,440	7,941 (45.5)	4,169 (23.9)	1,838 (10.5)
ON	161,384	67,916 (42.1)	34,748 (21.5)	16,429 (10.2)
PEI	2,376	1,073 (45.2)	547 (23.0)	231 (9.7)
SK	16,918	7,347 (43.4)	3,796 (22.4)	1,855 (11.0)

Bone

Table 2a) Number (%) of patient deaths meeting age inclusion criteria - by year

	Overall	Loose (Age 15-80)	Medium (Age 15-70)	Strict (Age 15-60)
Overall	335,793	193,359 (57.6)	101,097 (30.1)	49,508 (14.7)
2005	81,575	47,991 (58.8)	24,616 (30.2)	12,037 (14.8)
2006	84,036	48,458 (57.7)	25,309 (30.1)	12,368 (14.7)
2007	84,153	48,357 (57.5)	25,436 (30.2)	12,547 (14.9)
2008	86,029	48,553 (56.4)	25,736 (29.9)	12,556 (14.6)
AB	37,385	22,233 (59.5)	12,335 (33.0)	6,571 (17.6)
BC	55,610	31,261 (56.2)	16,407 (29.5)	8,259 (14.9)
MB	19,666	11,069 (56.3)	5,768 (29.3)	2,880 (14.6)
NB	14,671	8,382 (57.1)	4,314 (29.4)	1,953 (13.3)
NL	9,740	6,125 (62.9)	3,303 (33.9)	1,512 (15.2)
NS	17,440	10,221 (58.6)	5,323 (30.5)	2,431 (13.9)
ON	161,384	92,940 (57.6)	47,827 (29.6)	23,075 (14.3)
PEI	2,376	1,345 (56.6)	697 (29.3)	282 (11.9)
SK	16,918	9,331 (55.2)	4,838 (28.6)	2,389 (14.1)

Table 2b) Number (%) of in-hospital deaths meeting age inclusion criteria, as well as medical exclusions - by year/Province. See medical exclusions based on diagnostic codes from the Jan 2004 report.

	Overall	Loose (Age 15-80)	Medium (Age 15-70)	Strict (Age 15-60)
Overall	335,793	67,757 (20.2)	30,955 (9.2)	15,112 (4.5)
2005	81,575	16,965 (20.8)	7,504 (9.2)	3,648 (4.5)
2006	84,036	17,330 (20.6)	7,824 (9.3)	3,836 (4.6)
2007	84,153	16,815 (20.0)	7,732 (9.2)	3,767 (4.5)
2008	86,029	16,647 (19.4)	7,895 (9.2)	3,861 (4.5)
AB	37,385	6,905 (18.5)	3,458 (9.2)	1,964 (5.3)
BC	55,610	11,993 (21.6)	5,479 (9.9)	2,720 (4.9)
MB	19,666	3,637 (18.5)	1,692 (8.6)	839 ((4.3)
NB	14,671	3,000 (20.4)	1,315 (9.0)	600 (4.1)
NL	9,740	2,344 (24.1)	1,060 (10.9)	455 (4.7)
NS	17,440	3,348 (19.2)	1,485 (8.5)	643 (3.7)
ON	161,384	32,631 (20.2)	14,707 (9.1)	7,020 (4.3)
PEI	2,376	515 (21.7)	212 (8.9)	75 (3.2)
SK	16,918	3,236 (19.1)	1,462 (8.6)	748 (4.4)

Tendon

Table 3a) Number (%) of patient deaths meeting age inclusion criteria - by year

	Overall	Loose (Age 15-65)	Medium (Age 15-60)	Strict (Age 15-50)
Overall	335,793	71,942 (21.4)	49,508 (14.7)	19,629 (5.9)
2005	81,575	17,387 (21.3)	12,037 (14.8)	4,875 (6.0)
2006	84,036	18,028 (21.5)	12,368 (14.7)	4,992 (5.9)
2007	84,153	18,144 (21.6)	12,547 (14.9)	4,912 (5.8)
2008	86,029	18,383 (21.4)	12,556 (14.6)	4,915 (5.7)
AB	37,385	9,055 (24.2)	6,571 (17.6)	2,857 (7.6)
BC	55,610	11,800 (21.2)	8,259 (14.9)	3,312 (6.0)
MB	19,666	4,186 (21.3)	2,880 (14.6)	1,179 (6.0)
NB	14,671	3,034 (20.7)	1,953 (13.3)	702 (4.8)
NL	9,740	2,292 (23.5)	1,512 (15.2)	485 (5.0)
NS	17,440	3,712 (21.3)	2,431 (13.9)	887 (5.1)
ON	161,384	33,735 (20.9)	23,075 (14.3)	9,115 (5.7)
PEI	2,376	454 (19.1)	282 (11.9)	104 (4.4)
SK	16,918	3,456 (20.4)	2,389 (14.1)	988 (5.8)

Table 3b) Number (%) of in-hospital deaths meeting age inclusion criteria, as well as medical exclusions - by year/ Province. See medical exclusions based on diagnostic codes from the Jan 2004 report.

	Overall	Loose (Age 15-65)	Medium (Age 15-60)	Strict (Age 15-50)
Overall	335,793	21,785 (6.5)	15,220 (4.5)	5,832 (1.7)
2005	81,575	5,218 (6.4)	3,676 (4.5)	1,449 (1.8)
2006	84,036	5,525 (6.6)	3,863 (4.6)	1,488 (1.8)
2007	84,153	5,464 (6.5)	3,795 (4.5)	1,406 (1.7)
2008	86,029	5,578 (6.5)	3,886 (4.5)	1,489 (1.7)
AB	37,385	2,630 (7.0)	1,990 (5.3)	902 (2.4)
BC	55,610	3,866 (7.0)	2,735 (4.9)	1,041 (1.9)
MB	19,666	1,224 (6.2)	847 (4.3)	328 (1.7)
NB	14,671	929 (6.3)	601 (4.1)	234 (1.6)
NL	9,740	699 (7.2)	456 (4.7)	162 (1.7)
NS	17,440	996 (5.7)	650 (3.7)	215 (1.2)
ON	161,384	10,211 (6.3)	7,063 (4.4)	2,610 (1.6)
PEI	2,376	129 (5.4)	75 (3.2)	28 (1.2)
SK	16,918	1,037 (6.1)	754 (4.5)	293 (1.7)

Cardiac - Paediatric

Table 4a) Number (%) of patient deaths meeting age inclusion criteria - by year

	Overall	Loose (Age 0-15)	Medium (Age 0-10)	Strict (Age 0-5)
Overall	335,793	5,997 (1.8)	5,646 (1.7)	5,413 (1.6)
2005	81,575	1,564 (1.9)	1,477 (1.8)	1,416 (1.7)
2006	84,036	1,380 (1.6)	1,286 (1.5)	1,226 (1.5)
2007	84,153	1,568 (1.9)	1,485 (1.8)	1,434 (1.7)
2008	86,029	1,485 (1.7)	1,398 (1.6)	1,337 (1.6)
AB	37,385	1,139 (3.1)	1,084 (2.9)	1,047 (2.8)
BC	55,610	675 (1.2)	624 (1.1)	601 (1.1)
MB	19,666	422 (2.2)	390 (2.0)	372 (1.9)
NB	14,671	123 (0.8)	113 (0.8)	104 (0.7)
NL	9,740	133 (1.4)	122 (1.3)	115 (1.2)
NS	17,440	137 (0.8)	120 (0.7)	113 (0.7)
ON	161,384	3,020 (1.9)	2,860 (1.8)	2,748 (1.7)
PEI	2,376	9 (0.4)	9 (0.4)	9 (0.4)
SK	16,918	321 (1.9)	306 (1.8)	286 (1.7)

Table 4b) Number (%) of in-hospital deaths meeting age inclusion criteria, as well as medical exclusions - by year/ Province. See medical exclusions based on diagnostic codes from the Jan 2004 report.

	Overall	Loose (Age 0-15)	Medium (Age 0-10)	Strict (Age 0-5)
Overall	335,793	5,018 (1.5)	4,832 (1.4)	
2005	81,575	1,296 (1.6)	1,243 (1.5)	
2006	84,036	1,141 (1.4)	1,092 (1.3)	
2007	84,153	1,328 (1.6)	1,288 (1.5)	
2008	86,029	1,253 (1.5)	1,209 (1.4)	
AB	37,385	954 (2.6)	929 (2.5)	
BC	55,610	519 (0.9)	489 (0.9)	
MB	19,666	369 (1.9)	349 (1.8)	
NB	14,671	99 (0.7)	95 (0.6)	
NL	9,740	116 (1.2)	109 (1.1)	
NS	17,440	111 (0.6)	98 (0.6)	
ON	161,384	2,568 (1.6)	2,490 (1.5)	
PEI	2,376	8 (0.3)	8 (0.3)	
SK	16,918	259 (1.5)	250 (1.5)	

Cardiac- Adult

Table 5a) Number (%) of patient deaths meeting age inclusion criteria - by year

	Overall	Loose (Age 16-60)	Medium (Age 16-55)	Strict (Age 16-50)
Overall	335,793	49,407 (14.7)	31,689 (9.5)	19,528 (5.8)
2005	81,575	12,013 (14.7)	7,846 (9.6)	4,851 (6.0)
2006	84,036	12,336 (14.7)	7,939 (9.5)	4,960 (5.9)
2007	84,153	12,529 (14.9)	7,911 (9.4)	4,894 (5.8)
2008	86,029	12,529 (14.6)	8,094 (9.4)	4,888 (5.7)
AB	37,385	6,559 (17.5)	4,464 (11.9)	2,845 (7.6)
BC	55,610	8,244 (14.8)	5,364 (9.7)	3,297 (5.9)
MB	19,666	2,870 (14.6)	1,829 (9.3)	1,169 (5.9)
NB	14,671	1,952 (13.3)	1,163 (7.9)	701 (4.8)
NL	9,740	1,510 (15.5)	897 (9.2)	483 (5.0)
NS	17,440	2,428 (13.9)	1,448 (18.3)	884 (5.1)
ON	161,384	23,021 (14.3)	14,797 (9.2)	9,061 (5.6)
PEI	2,376	282 (11.9)	170 (7.2)	104 (4.4)
SK	16,918	2,385 (14.1)	1,557 (9.2)	984 (5.8)

Table 5b) Number (%) of in-hospital deaths meeting age inclusion criteria, as well as medical exclusions - by year/Province. See medical exclusions based on diagnostic codes from the Jan 2004 report.

	Overall	Loose (Age 16-60)	Medium (Age 16-55)	Strict (Age 16-50)
Overall	335,793	11,535 (3.4)	8,262 (2.5)	
2005	81,575	2,955 (3.6)	2,111 (2.6)	
2006	84,036	2,854 (3.4)	2,049 (2.4)	
2007	84,153	2,819 (3.3)	1,993 (2.4)	
2008	86,029	2,907 (3.4)	2,109 (2.5)	
AB	37,385	1,566 (4.2)	1,205 (3.2)	
BC	55,610	2,182 (3.9)	1,540 (2.8)	
MB	19,666	577 (2.9)	419 (2.1)	
NB	14,671	454 (3.1)	322 (2.2)	
NL	9,740	346 (3.6)	234 (2.4)	
NS	17,440	472 (2.7)	312 (1.8)	
ON	161,384	5,278 (3.3)	3,759 (2.3)	
PEI	2,376	60 (2.5)	40 (1.7)	
SK	16,918	558 (3.3)	404 (2.4)	

Skin

Table 6a) Number (%) of patient deaths meeting age inclusion criteria - by year

	Overall	Loose (Age 15-80)	Medium (Age 15-70)	Strict (Age 15-60)
Overall	335,793	193,359 (57.6)	101,097 (30.1)	49,508 (14.7)
2005	81,575	47,991 (58.8)	24,616 (30.2)	12,037 (14.8)
2006	84,036	48,458 (57.7)	25,309 (30.1)	12,368 (14.7)
2007	84,153	48,357 (57.5)	25,436 (30.2)	12,547 (14.9)
2008	86,029	48,553 (56.4)	25,736 (29.9)	12,556 (14.6)
AB	37,385	22,233 (59.5)	12,335 (33.0)	6,571 (17.6)
BC	55,610	31,261 (56.2)	16,407 (29.5)	8,259 (14.9)
MB	19,666	11,069 (56.3)	5,768 (29.3)	2,880 (14.6)
NB	14,671	8,382 (57.1)	4,314 (29.4)	1,953 (13.3)
NL	9,740	6,125 (62.9)	3,303 (33.9)	1,512 (15.2)
NS	17,440	10,221 (58.6)	5,323 (30.5)	2,431 (13.9)
ON	161,384	92,940 (57.6)	47,827 (29.6)	23,075 (14.3)
PEI	2,376	1,345 (56.6)	697 (29.3)	282 (11.9)
SK	16,918	9,331 (55.2)	4,838 (28.6)	2,389 (14.1)

Table 6b) Number (%) of in-hospital deaths meeting age inclusion criteria, as well as medical exclusions - by year/Province.

	Overall	Loose (Age 15-80)	Medium (Age 15-70)	Strict (Age 15-60)
Overall	335,793	69,114 (20.6)	31,459 (9.4)	15,271 (4.5)
2005	81,575	17,312 (21.2)	7,613 (9.3)	3,688 (4.5)
2006	84,036	17,660 (21.0)	7,947 (9.5)	3,874 (4.6)
2007	84,153	17,163 (20.4)	7,869 (9.4)	3,811 (4.5)
2008	86,029	16,979 (19.7)	8,030 (9.3)	3,898 (4.5)
AB	37,385	7,202 (19.3)	3,575 (9.6)	2,001 (5.4)
BC	55,610	12,178 (21.9)	5,559 (10.0)	2,752 (4.9)
MB	19,666	3,715 (18.9)	1,718 (8.7)	846 (4.3)
NB	14,671	3,027 (20.6)	1,318 (9.0)	599 (4.1)
NL	9,740	2,362 (24.3)	1,064 (10.9)	456 (4.7)
NS	17,440	3,414 (19.6)	1,512 (8.7)	653 (3.7)
ON	161,384	33,262 (20.6)	14,939 (9.3)	7,090 (4.4)
PEI	2,376	520 (21.9)	214 (9.0)	75 (3.2)
SK	16,918	3,280 (19.4)	1,473 (8.7)	751 (4.4)

Appendix B. Recommended 2010 Tissue Age Abstraction Criteria

Category/Tissue Type	Ocular	Bone	Tendon	Cardiac Paediatric	Cardiac Adult	Skin
Loose	2-80	15-80	15-65	0-15	16-60	15-80
Medium	2-70	15-70	15-60	0-10	16-55	15-70
Strict	2-60	15-60	15-50	0-5	16-50	15-60

Appendix C. Steering Committee Members

Listed alphabetically

Tracy Brand, Canadian Blood Services
Claire Marie Fortin, Canadian Institute for Health Information
Dr. John Gill, Providence Health Care
Mathias Haun, Canadian Blood Services
Jim Mohr, Canadian Blood Services
Christina Parsons, Canadian Blood Services
Dr. Peter Nickerson, Canadian Blood Services
Caren Rose, Providence Health Care
Francine Anne Roy, Canadian Institute for Health Information
Dr. Sam Shemie, Canadian Blood Services
Rick Trifunov, Canadian Blood Services
Bob Williams, Canadian Institute for Health Information
Kimberly Young (Chair), Canadian Blood Services