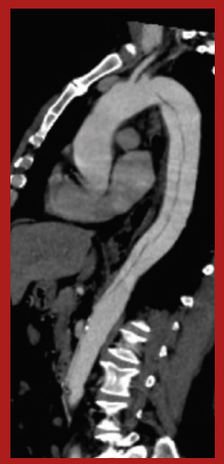


The Impact of Interhospital Transfer on Hospital Mortality for Aortic Dissection Within a Universal Healthcare System A Population Based Study

Clinical Problem

- Although acute type A aortic dissection is classically associated with a time dependent increase in mortality, interhospital transfer has not shown to increase mortality for Medicare patients within the US health system [Goldstone et al. Circulation 2019] or within the IRAD registry [Froehlich et al. Am J Med 2018]

- Given the differences and unique challenges faced by health systems worldwide, these results may not be generalizable

- Canada has a geographically large landmass and more regionalized cardiac care with much fewer cardiac surgery centers. Expeditious patient-transfer from rural communities to tertiary hospitals equipped to manage aortic dissections in a timely manner can prove challenging

- We sought to determine the impact of interhospital transfer on hospital mortality for type A and type B aortic dissections within the Canadian healthcare system

Study Purpose

Primary Outcome

- Determine death (mortality rate) for incident cases of thoracic aortic dissection (type A and type B) that:
  - are diagnosed at a non-cardiac surgery center and ***are not transferred*** to a cardiac surgery center
  - are diagnosed at a non-cardiac surgery center and ***die on-route to a cardiac surgery center***
  - are diagnosed at a non-cardiac surgery center ***and transfer to a cardiac surgery center*** for treatment
  - are diagnosed at a cardiac surgery center and ***treated at that same cardiac surgery hospital***

Secondary Outcomes

- To assess the average distance traveled for aortic dissection (type A and type B) for interhospital transfers
- To assess patient characteristics associated with non-transfers/palliation strategy (for type A dissection)

Inclusion Criteria

- All Ontario hospitals and all Ontario residents with an aortic dissection between March 2003 and April 2020

Exclusion Criteria

- (i) Non-Ontario residents at indexed date (ii) age <18 years of age at time of diagnosis (iii) patients with main or secondary diagnosis in 10 years prior to the indexed date

Methods

- Queried the Institute for Clinical Evaluative Sciences (ICES) databases between April 1, 2003 – March 31, 2020, to identify incident cases of aortic dissections

- ICES stores anonymously linked population-based health information on individual patients for the province of Ontario (~14.7 million persons). Data is linked across multiple databases using a unique encoded identifier

- Used diagnoses and procedural codes from the Canadian Institute of Health information to differentiate between type A and type B aortic dissections

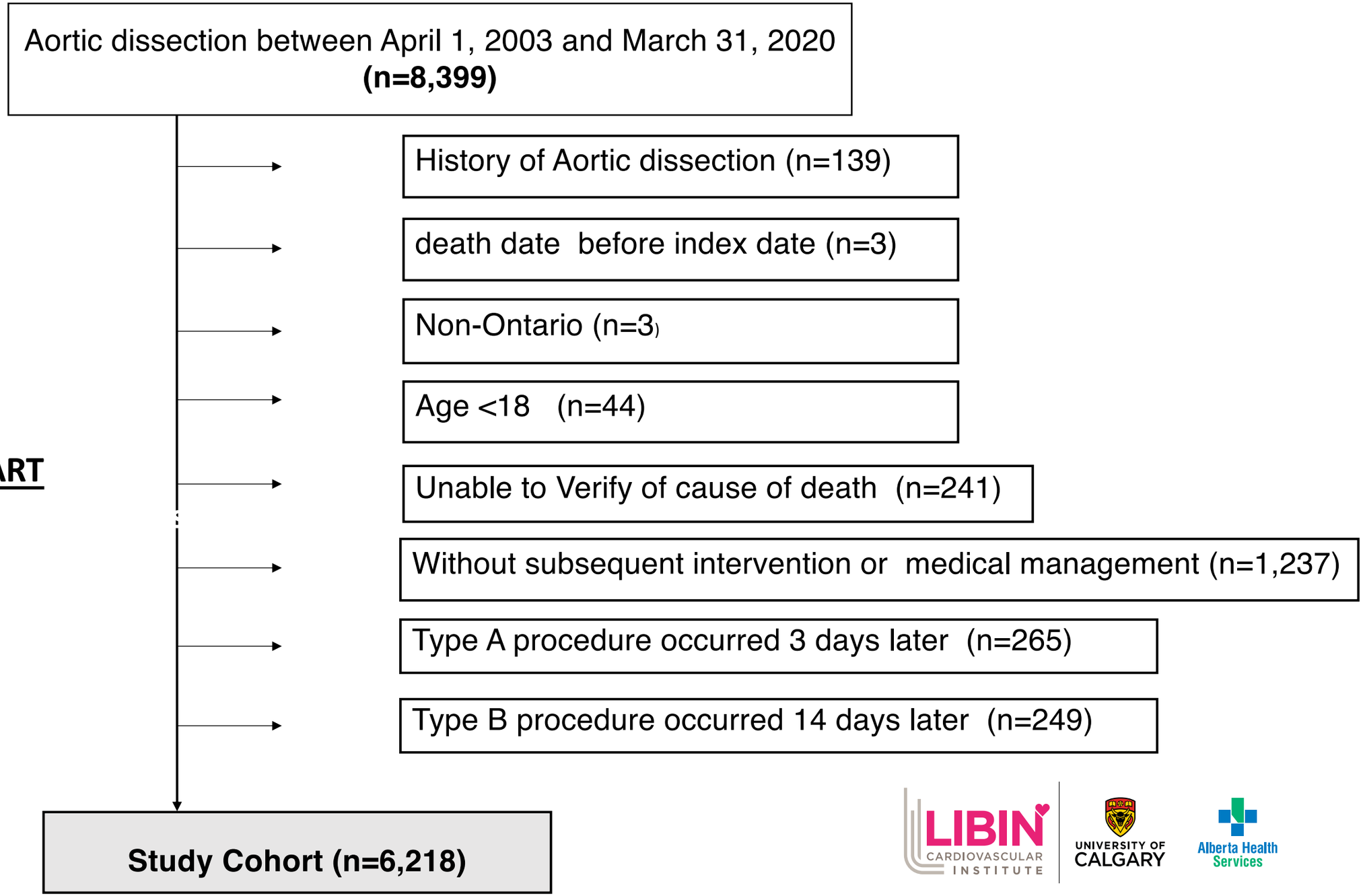
    - Diagnosis Codes were from the International Classification of diseases 10th edition (ICD-10-CA codes)
    - Procedure Codes were from the Canadian Classification of Health Interventions (CCI codes)

- Incident cases

    - Defined as cases with no prior aortic dissection diagnosis within the previous 10 years

Results

FLOWCHART



Baseline Characteristics	N=6,218				
Female	2,464	(39.6%)		Hypertension	4,577 (73.6%)
Age	<50	(10.9%)		Dyslipidemia	1,954. (31.4%)
	51- 74	(48.9%)			
	>75	(40.2%)		COPD	1,704 (27.4%)
Age (median ± SD)	68.7 ± 15			Diabetes	1,184 (19.0%)
Rural Residence	867	(13.9%)		CHF	978 (15.7%)
Income Quartile				Cog Impairment ● Stroke	322 ●122 (5.2%) ●(2.0%)
(lowest) 1	1,359	(21.9%)			
2	1,315	(21.1%)		Acute M.I.	265 (4.3%)
3	1,186	(19.1%)			
4	1,137	(18.3%)		Chronic Kidney Disease	220 (3.5%)
(highest)5	1,190	(19.1%)			
Unknown	31	(0.5%)		PVD	159 (2.6%)

	n		
Type B Dissection Cohort	3,577	100%	
Underwent Intervention	616	17%	
Transferred from Non-Cardiac Centre	743	21%	
	779/2413		32%
Transferred, No Intervention (Medical Therapy)	553/743		74%
Transferred, No Intervention (Medical Therapy) Hospital Mortality	15/553		2.7%
Non-Cardiac Centre, Transferred & Intervention Hospital Mortality	44/743		5.9%
			p=NS
Cardiac Centre Direct Admission & Intervention Hospital Mortality	88/1634		5.4%

Results

TRANSFER MORTALITY (30-DAY) /TYPE A DISSECTION

TYPE A DISSECTION	Total Patients	Death	Mortality	95% Confidence Interval
Non-Cardiac Centre Transferred for Consideration of Surgery	812	264	32.51%	(28.81-36.82)
Cardiac Center Direct Admission & Surgery	694	113	16.28%	(13.42-19.58)

Odds Ratio Estimates	Point Estimate	2.484	(1.936 – 3.187)

Results

TRAVEL DISTANCE / TYPE A DISSECTION

Non-Cardiac Centre Transferred for Consideration of Surgery	Total Patients	Measure		Mean	Median	Range	
	812	Km		73.13	34.58	0.589232 (minimum)	1337.73(maximum)

Hospital Transfer Distance and Mortality: NS

Crude rates (using gamma distribution)

Rank for Variable	Denominator	Numerator	Crude rate per 100	C.I (gamma method)
Total_kms				
1 [0.589 – 12.125]	161	55	34.16	(25.74 - 44.47)
2. [12.126 – 26.107]	173	52	30.06	(22.45 - 39.42)
3 [26.108 – 49.914]	143	37	25.87	(18.22 - 35.66)
4. [49.915 – 98.955]	172	57	33.14	(25.1 - 42.94)
5. [98.956 – 1337.73]	160	63	39.38	(30.26 - 50.38)

Results

TRANSFER MORTALITY (30-DAY) & TRAVEL DISTANCE / TYPE B DISSECTION

TYPE B DISSECTION	Total Patients	Death	Mortality	95% CI
No Transfer Stayed at a Non-Cardiac Centre	1,169	114	9.75%	(8.04-11.72)
Transferred Non-Cardiac Centre to Cardiac Centre	743	59	7.94%	(6.09-10.31)
Direct Admission to Cardiac Centre	1,634	182	11.14%	(9.58-12.88)

Odds Ratio Estimates	Point Estimate	0.863	(0.675 – 1.105)

Transferred Non-Cardiac to Cardiac Centre	Total Patients	Measure	Mean	Median	Range	
	743	Km	85.14	39.12	0.589232 (minimum)	1726.15(maximum)

Results

TRANSFER DIFFERENCES / TYPE A DISSECTION

Type A Dissections Presenting to a Non-Cardiac Centre

Factors Associated with Palliation Strategy vs. Transfer Strategy for Surgical Consideration

• Female	p<0.001
• Age >75	p<0.008
• Rural Residence	p<0.001
• Increased Charlson Co-morbidity Index	p<0.001

Study Limitations

- Administrative database data
- Potential for misclassification with algorithm to delineate Type “A” & Type “B” dissections
- Inability to delineate between land and air transfers (distance poor surrogate for time)

Conclusion

- In a Universal Healthcare System (Province of Ontario)
  - Interhospital transfer for type A dissection (but not type B dissection), was associated with **increased mortality** relative to patients diagnosed at a hospital providing onsite cardiac surgery services
  - More expedient transfer policies may improve aortic dissection outcomes
  - **Women were more likely than men** to have an initial care **pathway of palliation** versus interhospital transfer for consideration of emergent surgery
  - This sex-specific variance to transfer decisions warrants further study