Impact Of Social Determinants Of Health On Adherence To Care Of Rare Pediatric Eye Cancer Patients

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Background

- Eye cancers are malignant neoplasms that affect the eye and its surrounding structures[1]
- There are over 30 types of childhood eye cancers, the most common being retinoblastoma, a cancer of the retina (Figure 1).[1]
- There is a growing body of evidence that **Social Determinants of Health (SDH)** (Figure 2) contribute to inequitable health care experiences in childhood cancer patients, specifically regarding patient access to, and utilization of health care services.[2]

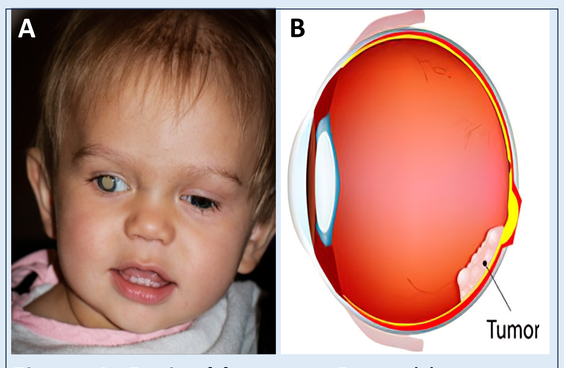


Figure 1: Retinoblastoma. Retinoblastoma is the most common primary intraocular tumor in children. Leukocoria, or "white pupil," is one of the primary signs of retinoblastoma (A). The tumor develops in the cells of the retina, the light sensitive lining of the eye (B).

Figure 2: Social Determinants of Health. Patient outcomes may be influenced by nonclinical factors, such as education access and quality, health care and quality, neighborhood and built environment, social and community context, and economic stability.

- Childhood cancer patients from families experiencing poverty are reportedly admitted more frequently to the Intensive Care Unit (ICU) and endure longer hospital stays than their economically stable counterparts.[3]
- There is limited information on the specific impact of the SDH on childhood eye cancer patients' outcomes in a Canadian health care setting.
- In the hospital setting, electronic health records (EHRs) offer a potential source of SDH information, however missing and misplaced data are known limitations of EHRs.

Study Objectives

- We aimed to:
  i. quantify the availability of SDH data in the EHR of eye cancer patients managed in the SickKids Department of Ophthalmology and Vision Sciences (DOVS);
  ii. characterize the population by SDH; and
  iii. explore the impact of SDH on clinic visit appointment status.

Methods

1. Retrospective Cohort Design
- A retrospective cohort study design was implemented with study dates between June-1st-2018 through May-23rd-2022.

2. Inclusion Criteria
- Study subjects were eligible if they:
  i. were diagnosed with an eye cancer
  ii. had at least one clinical encounter scheduled with SickKids DOVS; and
  iii. resided in Ontario.

3. Data Collection
- Data collected from the EHR included: Medical-Record-Number, sex, modified date of birth (MM-YYYY), ethnic group, race, preferred language, need for interpreter, postal code, guardians, legal guardian status, public insurance status, appointment data (dates and case status for each encounter: no-show, canceled, and completed) and diagnosis data (ICD-10-CM diagnosis)

4. Data Processing
- Postal code was used to deduce
  - Ontario Marginalization Index and neighborhood income quintile, using CHASS Canadian Census Analyzer with Postal Code OM Conversion File Plus (PCCF+) and SAS;
  - geographic location, using and filtering first digit of the FSA of postal codes on MS Excel;
  - urban/rural status, using and filtering the second digit of the FSA of postal codes on MS Excel
- Age at encounter was processed using MS excel and calculating the difference between date of encounter and birthdate (in months).

5. Data Analysis
- Summary statistics were used to characterize the study population and availability of SDH data.
- Chi-square tests were used to test for associations between SDH and outcomes, and multi-variable regression was used to control for confounders and establish true effects.
- Tests were carried out via SPSS.

Results

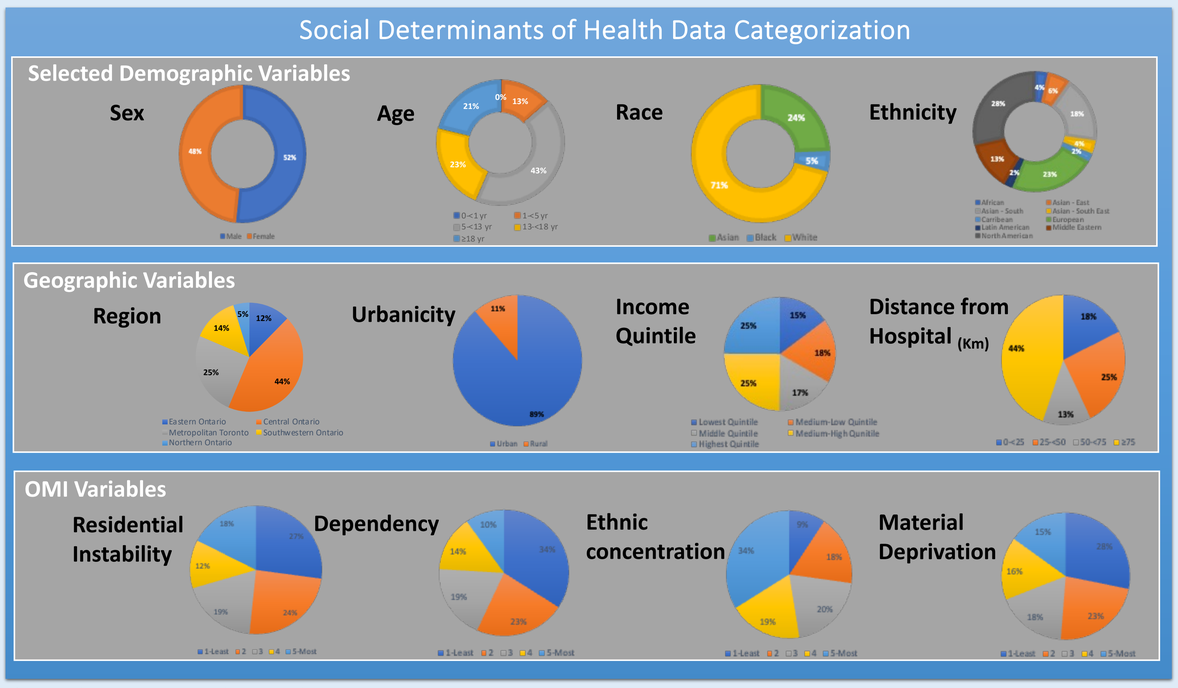
Table 1: Eye Cancer Diagnoses

ICD-10-CM Codes	n (%)
Total Study Subjects	**289 (100.0)**
Malignant Neoplasm: Retina	**193 (65.7)**
C69.2: Retinoblastoma	193 (65.7)
Malignant Neoplasm: Orbit	**15 (5.2)**
C49.0: Malignant neoplasm of connective and soft tissue, unspecified **(Rhabdomyosarcoma of face)**	3 (1.0)
C49.9: Malignant neoplasm of connective and soft tissue, unspecified **(Rhabdomyosarcoma of orbit)**	5 (1.7)
C74.9: Malignant neoplasm: Adrenal gland, unspecified **(Neuroblastoma)**	3 (1.0)
C69.6: Malignant neoplasm of orbit	3 (1.0)
C79.4, C80.0: Neuroblastoma metastatic to orbit with unknown primary site	1 (0.4)
Malignant Neoplasm: Eyelid	**3 (1.0)**
C44.9: Basal cell nevus syndrome	2 (0.7)
C44.1: Basal cell carcinoma	1 (0.4)
Malignant Neoplasms of Optic Nerve	**76 (26.3)**
C71.9: Low grade optic pathway glioma	14 (4.8)
C72.3: Optic nerve glioma	61 (21.1)
C72.5: Malignant neoplasm of other and unspecified cranial nerves	1 (0.4)
Other Malignant Neoplasms	**2 (0.7)**
C69.9: Malignant neoplasm of unspecified site of eye	1 (0.4)
D48.4: Iris tumour	1 (0.4)

Table 2: Social Determinant of Health Data Coverage

Characteristic	Data Available n (%)
Total Study Subjects	289
Collected Variables	
Sex	289 (100.0)
Age At End Of Study Period	289 (100.0)
Postal Code	289 (100.0)
Preferred Language	280 (96.9)
Interpreter Needed?	113 (39.1)
Ethnic Group	84 (29.1)
Gender	71 (24.6)
Race	41 (14.2)
Processed Variables	
Distance From Hospital (Km)	289 (100.0)
Neighbourhood Income Quintile	289 (100.0)
Urbanicity	289 (100.0)
Geographic Region In Ontario	289 (100.0)
OMI-Residential Instability	287 (99.3)
OMI-Material Deprivation	287 (99.3)
OMI-Dependency	287 (99.3)
OMI-Ethnic Concentration	287 (99.3)

*OMI is the Ontario Marginalization Index



*OMI is the Ontario Marginalization Index

Demographic Variables

- Individuals aged >13 were less likely to complete appointments as scheduled, and more likely to cancel and no-show to appointments, than individuals aged 0-13 (p=*<0.001*).
- Sex had no significant impact on appointment status.
- Data on race and ethnicity was limited leading to a low sample size to run reliable estimates.

Ontario Marginalization Index

- No show and cancelled appointments were most commonly associated with patients living in the most residentially unstable (p=*0.004),* materially deprived (p=*0.025*), ethnically concentrated (p=*0.035*) and dependent (p=*0.035*) neighbourhoods.

Geography

- No show and cancelled appointments were most commonly associated with patients living in low-medium neighbourhood income quintile (p=*0.05*), living ≥75km away from hospital (p=*0.020*) or residing in Northern Ontario (p=*0.032*).
- Rurality showed no significant impact on appointment status

When controlling for other SDH, age, neighbourhood income quintile, geographic region of residence, neighbourhood residential instability, neighbourhood material deprivation, neighbourhood dependency, neighbourhood ethnic concentration, and distance from hospital remained significant.

Discussion

- Our study demonstrates that the availability of SDH data in the EHR is limited, with variables such as gender, race, ethnicity and use of language interpreter largely missing.
  - The lack of availability of data highlights the need to develop standard practices for collecting SDH data to assemble complete data sets for the purpose of understanding the significance of SDH on patient outcomes in clinical care.
- Appointment status was associated with age, neighbourhood income quintile, geographic region of residence, neighbourhood residential instability, neighbourhood material deprivation, neighbourhood dependency, neighbourhood ethnic concentration, and distance from hospital, requiring further investigation for explanatory variables.
  - Our data may indicate that eye cancer patients who are aged 0-13, from low-medium quintile, from Northern Ontario, from residentially unstable neighbourhoods, material deprived neighborhoods, neighborhoods with high dependency, high ethnically concentrated neighbourhoods, and are living further from the hospital require additional supports or accommodations to reduce cancellation and no-show rates.
- Next steps will be to evaluate the relationship between the social determinants of health and eye cancer patients (i) individual patient adherence to care plan, (ii) care plan delay, (iii) urgent/ unplanned visits, and (iv) vision outcomes.

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