Identifying Geographic & Socioeconomic Disparities in Access to Care for Pediatric Cancer Patients in Texas

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University of Texas Health Science Center at Houston Medical School
& University of Texas MD Anderson Cancer Center
• Background
• Specific Aims
• Data Source(s)
• Methods
• Future Directions
• Questions
• Disparities in cancer burden and access to care by race/ethnicity and socioeconomic status are well described in adult population
• Less well defined in pediatric population
• Few studies exist & mostly focus on race/ethnicity
• Very limited information on geographic & socioeconomic barriers to care
The Unequal Burden of Cancer: An Assessment of NIH Research and Programs for Ethnic Minorities and the Medically Underserved

M. Alfred Haynes and Brian D. Smedley, Editors

Committee on Cancer Research Among Minorities and the Medically Underserved

Institute of Medicine

- Review status of cancer research relative to minorities and medically underserved populations
- Examine how well research results communicated and applied
- Examine the adequacy of NIH procedures for equitable recruiting and retention
The Unequal Burden of Cancer: An Assessment of NIH Research and Programs for Ethnic Minorities and the Medically Underserved

- Comprehensive review of racial and ethnic disparities in cancer burden and care
- Recommendations to NIH
- Recognized the potential mistake in attributing health disparities to race or ethnicity alone
• Population-based study using linked data from SEER and National Longitudinal Mortality Study

• Significant variability in incidence and late-stage disease between groups

• Differences were specific to cancer type
What is published in pediatric literature?

**REVIEW**

**Disparities in Cancer Outcomes: Lessons Learned From Children With Cancer**

Smita Bhatia, MD, MPH*

Pediatr Blood Cancer 2011;56:994–1002

- Comprehensive review of literature on racial and ethnic disparities in outcome of selected childhood cancers
- Most studies focus on racial/ethnic variability in hematologic malignancies
- Few studies evaluate patients with solid tumors
- Few studies evaluate socioeconomic or geographic impact
## REVIEW

Disparities in Cancer Outcomes: Lessons Learned From Children With Cancer

Smita Bhatia, MD, MPH*

*Pediatr Blood Cancer 2011;56:994–1002

### TABLE I. Survival in Children and Adolescents With Cancer by Race and Ethnicity

<table>
<thead>
<tr>
<th>Study</th>
<th>Cohort size</th>
<th>Whites</th>
<th>Blacks</th>
<th>Hispanics</th>
<th>Asians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute lymphoblastic leukemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEER database 5-year OS8</td>
<td>4,952</td>
<td>84%</td>
<td>75%</td>
<td>72%</td>
<td>81%</td>
</tr>
<tr>
<td>Cooperative group 5-year EFS9</td>
<td>8,447</td>
<td>72.8 ± 0.6%</td>
<td>61.5 ± 2.2%</td>
<td>65.9 ± 1.5%</td>
<td>75.1 ± 3.5%</td>
</tr>
<tr>
<td>Cooperative group 5-year OS10</td>
<td>5,086</td>
<td>81.9 ± 0.6%</td>
<td>68.6 ± 2.1%</td>
<td>74.9 ± 2%</td>
<td>—</td>
</tr>
<tr>
<td>Single institution 5-year EFS11</td>
<td>412</td>
<td>79.4% (74.7–84.1)</td>
<td>80.7% (70.3–91.1)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Acute myeloid leukemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperative group 5-year OS15</td>
<td>791</td>
<td>48 ± 4%</td>
<td>34 ± 10%</td>
<td>37 ± 9%</td>
<td>—</td>
</tr>
<tr>
<td>Cooperative group 5-year OS15</td>
<td>850</td>
<td>60 ± 4%</td>
<td>45 ± 12%</td>
<td>51 ± 8%</td>
<td>—</td>
</tr>
<tr>
<td>Single institution 5-year EFS16</td>
<td>287</td>
<td>31.2 ± 3.5%</td>
<td>29.3 ± 6.4%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hodgkin lymphoma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single institution 5-year EFS18</td>
<td>327</td>
<td>84 ± 2.4%</td>
<td>71 ± 6.1%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Rhabdomyosarcoma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperative group 5-year EFS19</td>
<td>2,057</td>
<td>66%</td>
<td>61%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuroblastoma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperative group 5-year EFS26</td>
<td>3,539</td>
<td>67% (65–69%)</td>
<td>56% (50–625%)</td>
<td>69% (63–74%)</td>
<td>62% (51–71%)</td>
</tr>
</tbody>
</table>
・Why?
  - Socioeconomic & health insurance coverage
  - Access to care
  - Knowledge about cancer diagnosis, treatment, and toxicities
  - Cancer surveillance
  - Risky health behaviors
  - Disease biology
SEER data
Survival trends in children and adolescents (birth to age 19 years) across 5-year cohorts
Increased 5- and 10-year survival rates
Lower 5-year survival among Hispanic children & adolescents (74% vs. 81%)
• 3,539 patients with neuroblastoma enrolled in Children’s Oncology Group (COG) between 2001-1009
• Blacks & Native Americans had a higher prevalence of high-risk disease compared to whites and significant worse EFS
• Adjustment for risk group abrogated the differences
• In high-risk black patients increased prevalence of late-occurring events
• All Norwegian children diagnosed with cancer between 1974-2007 (n=6,280)
• Mortality decreased in patients with educated mothers & no siblings
• No difference associated with marital status of parents, combined earnings, mother’s age at diagnosis
• Population-based data from Australian Paediatric Cancer Registry (n=6,289)

• Australian Standard Geographical Classification Remoteness Areas

• Index of Relative Socioeconomic Disadvantage
• Children from remote/very remote areas lower survival rate (HR 1.55, 95% CI 1.08-2.23)

• Trend towards lower survival in patients from most disadvantaged areas (p=0.051)
• Literature review on diagnosis delays in childhood cancer
• 3 Categories: patient and/or parent, disease and healthcare system
• Healthcare factors included distance, number of visits, and first health professional contacted
# Diagnosis Delays in Childhood Cancer

**A Review**

<table>
<thead>
<tr>
<th>Healthcare factor</th>
<th>Study</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>Klein-Geltink(^2)</td>
<td>No association for patient or physician delay.</td>
</tr>
<tr>
<td></td>
<td>Fajardo-Gutierrez(^4)</td>
<td>Children who lived near Mexico City had a lower risk of lag time than children who lived far from Mexico City.</td>
</tr>
<tr>
<td></td>
<td>Chantada(^2)</td>
<td>No significant difference in patient delay between patients living in urban and rural or between those living in Buenos Aires and the rest of the country.</td>
</tr>
<tr>
<td>No. of visits</td>
<td>Haimi(^1)(^8)</td>
<td>Positive correlation between the no. of times a child visits a physician and lag time</td>
</tr>
<tr>
<td>First health professional contacted</td>
<td>Klein-Geltink(^5)</td>
<td>Compared with a first pediatrician contact, patients who first visited a general practitioner had a lower risk of patient delay. Patients who first visited the emergency room had a lower risk of physician delay.</td>
</tr>
<tr>
<td></td>
<td>Chantada(^2)(^2)</td>
<td>No significant difference in patient delay</td>
</tr>
<tr>
<td></td>
<td>Goddard(^2)(^3)</td>
<td>No significant difference in patient delay; significant difference in physician delay</td>
</tr>
<tr>
<td></td>
<td>Goyal(^1)(^3)</td>
<td>Diagnosis delay and patient delay longer for patients who initially contacted a general practitioner than for patients who contacted the emergency room.</td>
</tr>
<tr>
<td></td>
<td>Haimi(^1)(^8)</td>
<td>Diagnosis and physician delay shorter for patients examined by pediatricians compared with family physicians or other specialists</td>
</tr>
</tbody>
</table>

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**UTHealth**

The University of Texas Health Science Center at Houston
Medical School

**MD Anderson Cancer Center**

Children's Cancer Hospital
• No previous studies evaluate the impact of geography on pediatric cancer burden and outcomes in US
• Few studies evaluate socioeconomic factors related to pediatric cancer
• Texas provides geographic, racial/ethnic & socioeconomic diversity in a large population
Specific Aim 1

• 1A – To determine if patient distance to definitive cancer care impacts stage at diagnosis.

• 1B – To determine if patient distance to definitive cancer care impacts survival.
Hypotheses

• Patients with longer distances to definitive cancer care present with later stage disease.

• Patients with longer distances to definitive cancer care have poorer overall & event free survival.
Data Sources

• Texas Discharge Data
  – To identify pediatric cancer treatment centers & map centers

• Texas Cancer Registry
  – All pediatric (age < 18 years) patients included in TCR between 1995 and 2008
Texas Discharge Data

- Source: Texas Department of State Health Services, Texas Health Care Information Collection, Center for Health Statistics, Statistical Brief, July 2010, Pediatric Hospital Stays for Cancer, 2008

Table 1. Pediatric cancer hospitalizations compared with all pediatric hospital stays, 2008

<table>
<thead>
<tr>
<th></th>
<th>Pediatric hospital stays for cancer*</th>
<th>All pediatric hospital stays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hospital stays</td>
<td>5,846 (2.7%)</td>
<td>220,153 (100%)</td>
</tr>
<tr>
<td>Mean age</td>
<td>8.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Ratio of male to female</td>
<td>1.13</td>
<td>0.96</td>
</tr>
<tr>
<td>Mean length of stay (in days)</td>
<td>6.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Mean charge per stay</td>
<td>$63,133</td>
<td>$25,037</td>
</tr>
<tr>
<td>Mean charge per day</td>
<td>$9,213</td>
<td>$4,848</td>
</tr>
<tr>
<td>Aggregate charges (in millions)</td>
<td>$369</td>
<td>$5,612</td>
</tr>
<tr>
<td>Percentage admitted through the emergency department</td>
<td>11.9%</td>
<td>42.9%</td>
</tr>
<tr>
<td>Percentage died in the hospital</td>
<td>1.2%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>
Texas Discharge Data

- Source: Texas Department of State Health Services, Texas Health Care Information Collection, Center for Health Statistics, Statistical Brief, July 2010, Pediatric Hospital Stays for Cancer, 2008

**Table 3. Top 10 most common pediatric cancer hospitalizations, 2008**

<table>
<thead>
<tr>
<th>Principal diagnosis</th>
<th>Total number of stays</th>
<th>Mean length of stay</th>
<th>Mean charge per stay</th>
<th>Percent admitted through the ED</th>
<th>Percent died in the hospital</th>
<th>Mean age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance chemotherapy, radiotherapy</td>
<td>3,264</td>
<td>4.5</td>
<td>$36,416</td>
<td>0.9%</td>
<td>0.2%</td>
<td>8.8</td>
</tr>
<tr>
<td>Leukemias</td>
<td>696</td>
<td>14.8</td>
<td>$146,928</td>
<td>34.3%</td>
<td>1.7%</td>
<td>7.0</td>
</tr>
<tr>
<td>Cancer of brain and nervous system</td>
<td>331</td>
<td>11.7</td>
<td>$107,316</td>
<td>31.7%</td>
<td>5.1%</td>
<td>7.4</td>
</tr>
<tr>
<td>Neoplasms of unspecified nature or uncertain behavior</td>
<td>200</td>
<td>7.8</td>
<td>$82,138</td>
<td>23.5%</td>
<td>**</td>
<td>8.8</td>
</tr>
<tr>
<td>Cancer of bone and connective tissue</td>
<td>186</td>
<td>7.5</td>
<td>$70,291</td>
<td>16.1%</td>
<td>3.2%</td>
<td>10.0</td>
</tr>
<tr>
<td>Secondary malignancies</td>
<td>151</td>
<td>6.5</td>
<td>$52,394</td>
<td>15.9%</td>
<td>8.6%</td>
<td>11.1</td>
</tr>
<tr>
<td>Cancer, other and unspecified primary</td>
<td>126</td>
<td>10.3</td>
<td>$104,776</td>
<td>17.5%</td>
<td>**</td>
<td>5.4</td>
</tr>
<tr>
<td>Non-Hodgkin's lymphoma</td>
<td>98</td>
<td>12.2</td>
<td>$140,960</td>
<td>38.8%</td>
<td>5.1%</td>
<td>9.1</td>
</tr>
<tr>
<td>Cancer of kidney and renal pelvis</td>
<td>81</td>
<td>10.6</td>
<td>$105,929</td>
<td>30.9%</td>
<td>**</td>
<td>4.3</td>
</tr>
<tr>
<td>Cancer of liver and intrahepatic bile duct</td>
<td>40</td>
<td>17.0</td>
<td>$198,926</td>
<td>17.5%</td>
<td>**</td>
<td>5.1</td>
</tr>
</tbody>
</table>
Texas Cancer Registry

- Source: Texas Department of State Health Services, Cancer Epidemiology and Surveillance Branch, Texas Cancer Registry, Incidence - Texas, 1995-2008, Cut-off 11-24-10, SEER*Prep 2.4.3.

<table>
<thead>
<tr>
<th></th>
<th>Age 0-14 years</th>
<th>Age 0-19 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ICCC Groups Combined</td>
<td>8,540</td>
<td>12,186</td>
</tr>
<tr>
<td>Hematologic Malignancies</td>
<td>3,838</td>
<td>5,183</td>
</tr>
<tr>
<td>CNS Tumors</td>
<td>1,782</td>
<td>2,155</td>
</tr>
<tr>
<td>Non-CNS Solid Tumors</td>
<td>2,894</td>
<td>4,786</td>
</tr>
<tr>
<td>Unspecified or in situ</td>
<td>49</td>
<td>91</td>
</tr>
</tbody>
</table>
Independent Variables

• Distance (continuous or categorical)
• Confounders
  – Age
  – Sex
  – Race/Ethnicity
  – Stage
  – Other (histology, tumor location, treatment)
Dependent Variables

• Stage at diagnosis
  – Must exclude all leukemia patients and lymphoma

• Survival
  – 3-, 5-year overall & event free survival
Other Questions

• Identify referral patterns for pediatric cancer care
• Describe characteristics specific to Hispanic children with cancer
• Evaluate border effects in pediatric population
Future Direction & Goals

• To determine if patient’s socioeconomic status impacts stage of disease at presentation.

• To determined if patient’s socioeconomic status impacts survival.
Thank You

Linda Elting, DrPH

James Goodwin, MD