Influence of Socioeconomic Status and Hospital Type on Disparities of Lymph Node Evaluation in Colon Cancer Patients

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Background

- Stage III colon patients benefit from adjuvant chemotherapy

- Lymph node status is the key element for differentiating stage II & III disease

- A minimum of 12 dissected lymph nodes (LNs) has been recommended as a consensus guideline for resections in colon cancer patients

- Since 2007 this guideline becomes a quality of cancer care measure for resected colon cancer

Objectives

- To assess the influence of both socioeconomic status (SES) and hospital type on compliance with colon LN dissection guideline

- To examine time trends of having an adequate number (12 or more) of LNs dissected

Data source and eligibility

- Louisiana Tumor Registry
- First primary invasive colon cancer cases
- Diagnosed between 1996 and 2007
- Microscopically confirmed
- Stages I-III tumor
- Underwent a surgical resection

Data Exclusions

- Familial adenomatous polyposis, carcinoid colon cancer, colon sarcomas, and lymphomas

- Cases with non-specified or unknown number of LNs examined

- Race other than white and black

- Census tract coded based only on address of Post Office Box

Variables

- Outcome variable: 12 or more LNs dissected

- Independent variables
  - Socioeconomic Status (SES): Census tract level SES
  - Hospital type
  - Demographics: Sex, race, age
  - Clinical variables:
    - AJCC Stage
    - Histological grade
    - Anatomic subsite
  - Diagnosis year

AJCC Staging

- Sixth edition AJCC staging was used
- 1996-2003 cases: staging was converted from SEER Extent of Disease to the 6th edition AJCC staging
- 2004-2007 cases: 6th edition AJCC staging derived from Collaborative Staging was used
- Discrepancies between the converted or derived AJCC staging with the originally coded AJCC TNM staging were manually reviewed and resolved

Measure of SES

- Used a census tract-level SES as a surrogate for individual-level SES

- Geocoded patient's street address at diagnosis at census tract level using 2000 Census data

- Patients with census tract coded to ZIP code only were assigned randomly to tracts within their parishes

Measure of SES cont'd

- Used principal component analysis to create a composite SES score based on three social and economic measures
  - Education
  - Poverty
  - Income
- Census tracts were grouped into quintiles of the first component scores
- Each patient was assigned to a SES quintile

Categorizing Hospital Type

- According to the definition of the ACoS and the CoC Accreditation:
  - Teaching Hospital Cancer Programs (THCP)
  - Community Hospital Comprehensive Cancer Programs (COMP)
  - Community Hospital Cancer Programs (CHCP)
  - Public hospitals including VA and militarily based hospitals
  - Others (Non-CoC/non-public hospitals including surgical clinics)

Statistical analysis

- Logistic regression analyses were carried out to estimate unadjusted/adjusted associations and to identify statistically significant predictors

- Proportions of cases with adequate number of LNs dissected over time were assessed by the Cochran-Armitage test for linear trend

Results: Data description

- 10,460 eligible colon cancer cases (73.0% were whites)

- 56.1 % of colon cancer patients had < 12 LNs dissected

- Median number of LNs dissected was 10 (interquartile range: 6, 16)

- 39.5% received colon resections at non-CoC/non-public hospitals and only 6.4% at non-teaching public hospitals

- 54.3% of the white patients lived in the two most affluent areas (1st and 2nd quintiles); higher than black patients (19.2%)

Results: Demographic factors

	Unadjusted		Adjusted	
	Odds Ratio	(95% CI)	Odds Ratio	(95%CI)
Race				
White	1.00	(referent)	1.00	(referent)
Black	0.97	(0.89 - 1.06)	0.87	(0.78 - 0.96)
Sex				
Male	1.00	(referent)	1.00	(referent)
Female	1.06	(0.98 - 1.15)	1.06	(0.97 - 1.15)
Age at diagnosis				
20-49	1.00	(referent)	1.00	(referent)
50-59	0.78	(0.67 - 0.92)	0.77	(0.65 - 0.92)
60-69	0.66	(0.57 - 0.77)	0.62	(0.53 - 0.73)
70-79	0.59	(0.50 - 0.68)	0.52	(0.44 - 0.61)
≥ 80	0.51	(0.44 - 0.60)	0.41	(0.35 - 0.49)

Results: Clinical Factors

	Unadjusted		Adjusted	
	Odds Ratio	(95% CI)	Odds Ratio	(95%CI)
AJCC stage				
Stage I	1.00	(referent)	1.00	(referent)
Stage II	2.01	(1.81 - 2.23)	1.99	(1.78 - 2.22)
Stage III	2.48	(2.23 - 2.76)	2.32	(2.07 - 2.61)
Histological grade				
Well Diff	1.00	(referent)	1.00	(referent)
Moderately Diff	1.71	(1.45 - 2.02)	1.54	(1.29 - 1.84)
Poorly or Undiff	2.57	(2.15 - 3.08)	1.92	(1.57 - 2.33)
Unknown	0.85	(0.67 - 1.09)	0.93	(0.72 - 1.21)
Anatomic subsite				
Right	1.00	(referent)	1.00	(referent)
Transverse	0.69	(0.60 - 0.79)	0.65	(0.56 - 0.75)
Left	0.45	(0.41 - 0.49)	0.43	(0.39 - 0.47)
Overlapping or Unk	0.64	(0.48 - 0.86)	0.60	(0.44 - 0.83)

# Results: SES, Hospital Type, Diagnosis Year

	Unadjusted		Adjusted	
	Odds Ratio	(95% CI)	Odds Ratio	(95%CI)
SES level				
1st (Most affluent)	1.00	(referent)	1.00	(referent)
2nd	0.94	(0.84 - 1.05)	1.03	(0.91 - 1.16)
3rd	0.90	(0.80 - 1.01)	1.06	(0.93 - 1.20)
4th	0.83	(0.73 - 0.93)	0.96	(0.84 - 1.10)
5th (Least affluent)	0.87	(0.76 - 0.98)	1.06	(0.92 - 1.23)
Hospital type				
THCP	1.00	(referent)	1.00	(referent)
COMP	1.02	(0.88 - 1.17)	0.98	(0.84 - 1.14)
CHCP	0.78	(0.66 - 0.91)	0.69	(0.59 - 0.82)
Public	0.60	(0.49 - 0.73)	0.54	(0.43 - 0.66)
Non-CoC/Non-public	0.57	(0.50 - 0.66)	0.54	(0.46 - 0.63)
Diagnosis year				
1996-2001	1.00	(referent)	1.00	(referent)
2002-2007	1.89	(1.75 - 2.04)	1.99	(1.84 - 2.17)

Summarized Findings: Factors associated with LN dissections

- All clinical factors, diagnosis year, and hospital type were significantly associated with adequate number of LN dissected in both unadjusted and adjusted models

- SES alone was significantly associated with adequate number of LN dissected; after controlling for race and/or hospital type SES was no longer significant

- Race was significantly associated with LN dissected after adjustment

- Gender remains not significant after adjustment

Results: Trend Analysis

Trends of proportion of ≥12 LNs dissected by hospital type: 1996-2007
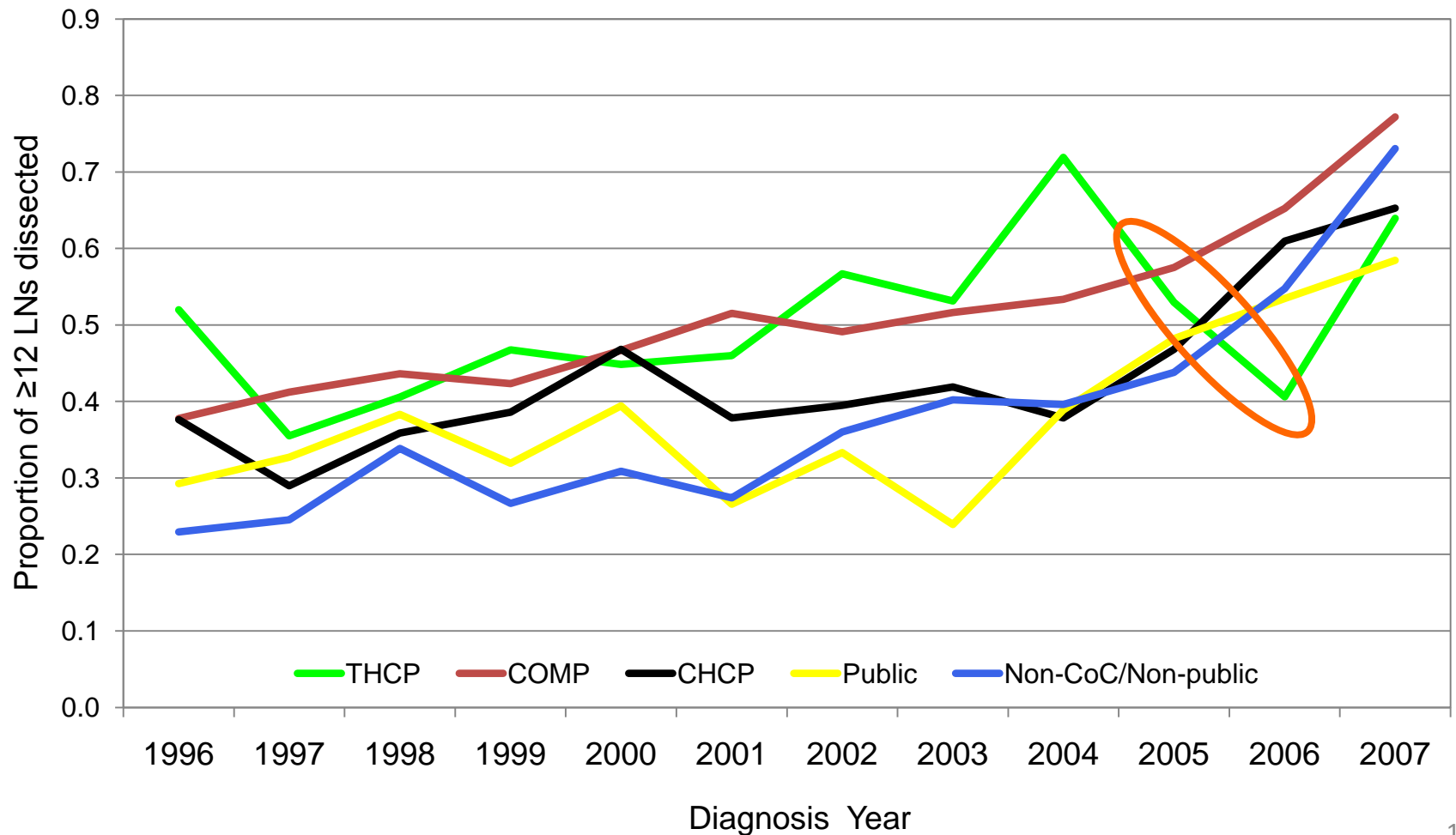
Reasons for insufficient LNs dissected /examined at THCP in 2005 and 2006

- Three major Teaching Hospitals located in New Orleans area performed about 73% of colon resections in all THCPs combined statewide

- Shortage in both physicians and pathology laboratory staff, which might result in either fewer lymph nodes removed/examined or limited documentation in pathology reports

Summarized Findings: Trend Analysis

- Overall trend for the proportion of ≥12 LNs dissected was of an increase over time

- After 2004, steeper increase trends of ≥12 LNs dissected were observed for all hospital types except THCP

Results: Compliance of dissecting ≥12 LNs

Odds ratios of ≥12 LNs dissected among hospital types by diagnosis time period
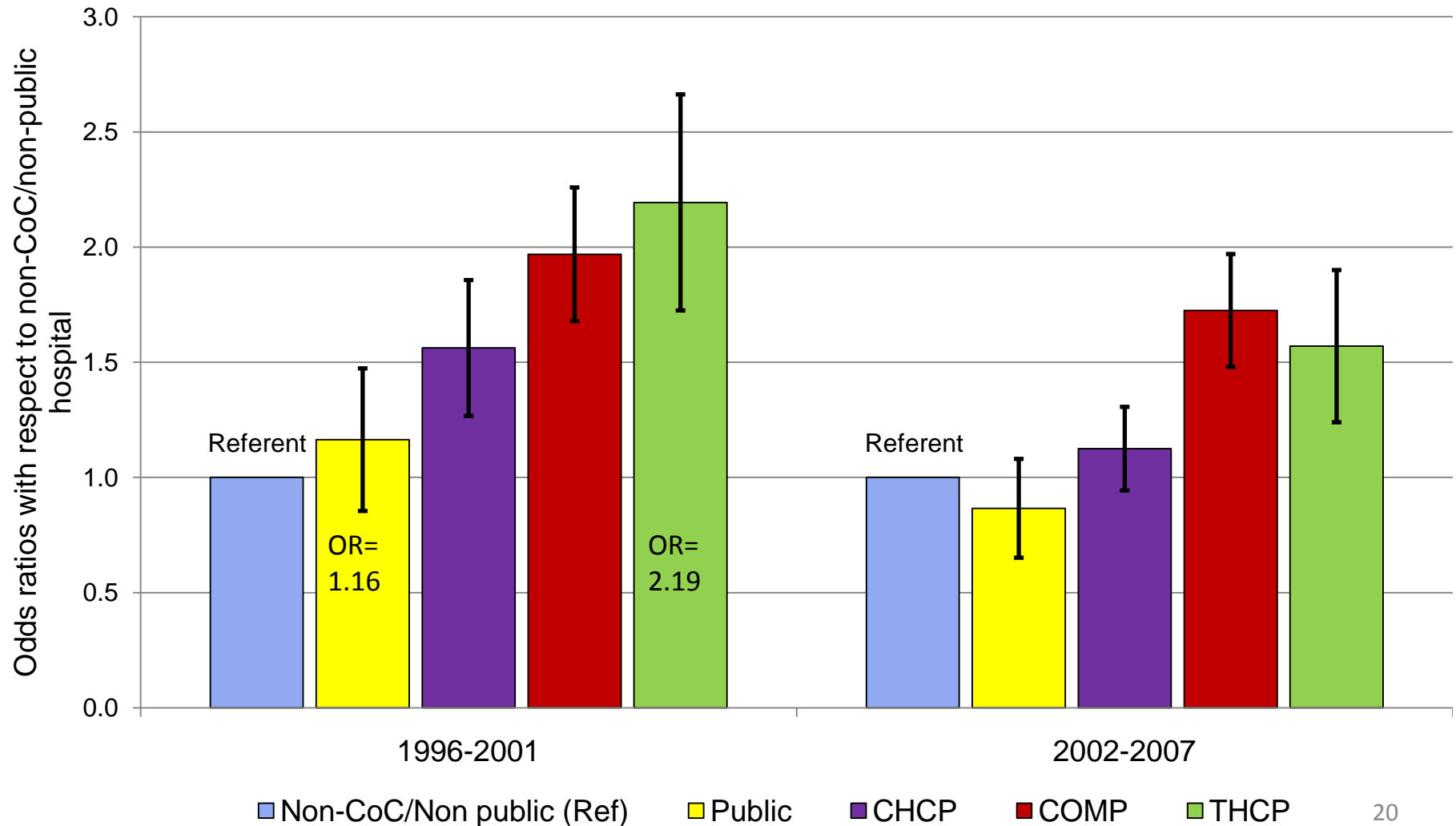
Conclusions

- Hospital type is a more important factor than SES for evaluating the adequate number of LN dissections in colon cancer

- Louisiana network of 10 public hospitals (3 of them are teaching hospitals) helps to reduce health care disparities in SES disadvantaged residents

Conclusions cont'd

- Increases in compliance with colon resection guidelines (≥12 LNs dissected) in Louisiana were steady over time

- The differences of having ≥12 LNs dissected among the five hospital types were reduced in the 2002-2007 time period

- Increased awareness of the benefit of adequate LN evaluation was observed among all hospital types

Limitations

- Effect of surgeon specialty and volume are not evaluated

    - Surgeon specialty and volume may affect treatment decisions, as well as a patient's health outcome

- Lack of information in pathology practices

    - Practice of a pathology laboratory and thoroughness of the pathologist's examination could affect the counts on the number of LNs examined and the finding of positive LNs

Limitations

- Patient's health insurance coverage is not included in this analysis

  - Type of health insurance that a patient has or the lack of insurance, can limit the patient's choice of health-care facility

  - Louisiana has a public hospital network, we anticipate insurance status would be less impacted

Thank You!

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