HEALTH CARE SYSTEM FACTORS ASSOCIATED WITH RECEIPT OF TREATMENT AND TREATMENT INTENT IN STAGE III NON-SMALL CELL LUNG CANCER: A POPULATION-BASED STUDY IN ONTARIO

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BACKGROUND

Stage III non-small cell lung cancer (NSCLC) is a disease with a spectrum of anatomic extent, patient health status, and treatment approaches. Receipt of treatment and its intent should be independent of health system-level factors when health care quality is optimal. Factors outside of a patient's control, such as expertise at presenting cancer centre, access to multidisciplinary care, and neighbourhood of residence have been associated with what treatment a patient receives in NSCLC. We investigated whether health care system-level factors are associated with receipt of treatment and treatment intent in stage III NSCLC in Ontario.

METHODS

Population-based, retrospective cohort study using health administrative data from Ontario from 2010-2018 of patients aged ≥20 years and AJCC 7 or 8 stage III NSCLC. **Health care system factors** associated with NSCLC treatment we explored were: year of diagnosis, LHIN of residence, travel distance to nearest cancer centre, and treatment volume by type of radiotherapy and systemic at nearest cancer centre. The relative risk (RR) of (1) any treatment versus no treatment and (2) palliative versus curative treatment was determined using multivariable stepwise Poisson regression models, adjusting for patient, disease and treatment factors, such as age, sex, income quintile, substage, comorbidity, and histology.

RESULTS

~7100 patients were identified (**Table 1**). Factors associated with any treatment versus no treatment were *age*, *commodity index*, *dementia*, *palliative care consultation*, and *geriatric consultation*, but no associated system factors. Similar factors were associated with palliative versus curative treatment, as well as *histology* and *substage*. We saw substantial variability in likelihood of curative treatment by LHIN of residence (RR range 0.88-1.67, p<0.001) (**Table 2**). Use of immunotherapy and advanced radiotherapy increased over time, yet variability by LHIN of residence remained in an era-based sensitivity analysis.

Table 1—Patient, Disease, and Treatment Characteristics (Selected)

Patient Characteristics	Total	Type of Treatment		
		No Treatment	Curative Treatment	Palliative Treatment
Median Age (IQR)*	70 (63-77)	**76 (68-82)**	**67 (60-74)**	72 (64-78)
Female	47.3%	47.2%	47.4%	47.1%
Urban Residence	57.5%	55.2%	56.8%	59.9%
Elixhauser Comorbidity Index ≥1*	40.0%	**52.3%**	**28.3%**	35.8%
Comorbidity -COPD*	53.0%	**62.2%**	**48.1%**	53.9%
-Dementia*	4.7%	**12.1%**	**1.8%**	3.7%
III/IIIA*	67.3%	70.3%	**74.3%**	**54.9%**
Treatment -Systemic	48.6%	N/A	**76.7%**	**41.2%**
-Radiotherapy	66.9%	N/A	**84.5%**	**87.6%**
Radiotherapy -Basic	35.4%	N/A	**28.2%**	**70.6%**
-Advanced	40.8%	N/A	**69.4%**	**27.1%**
Treatment Era -2010-2012	36.6%	**40.9%**	34.6%	**36.5%**
-2013-2015	32.3%	**32.8%**	31.3%	**33.5%**
-2016-2018	31.1%	**26.4%**	34.1%	**30.0%**
PET Scan*	65.2%	29.2%	88.0%	56.9%
Consultations -Palliative Care*	24.1%	**32.3%**	**10.5%**	**38.4%**
-Geriatrics*	1.8%	**4.4%**	**0.7%**	**1.6%**
Mean Immunotherapy Volume (± SD)*	6.8 ± 13.1	5.8 ± 12.0	**7.4 ± 13.9**	**6.6 ± 12.7**

Bold = clinically meaningful differences (>10% relative difference)
Asterix (*) = statistical differences in multivariable analysis (p<0.05)

Table 2—Multivariable Regression: LHIN and Palliative vs Curative Intent

Variable	Unadjusted Analysis		Adjusted Analysis	
	RR (95% CI)	P-value	RR (95% CI)	P-value
LHIN A (Ref.)				
B	0.92 (0.75-1.13)	0.416	0.88 (0.73-1.05)	0.159
C	1.06 (0.88-1.27)	0.552	1.18 (0.99-1.41)	0.070
D	1.39 (1.16-1.68)	<0.001	**1.67 (1.38-2.01)**	**<0.001**
E	1.21 (1.02-1.44)	0.025	**1.35 (1.16-1.57)**	**<0.001**
F	0.99 (0.80-1.24)	0.950	1.13 (0.91-1.41)	0.258
G	1.16 (0.96-1.40)	0.123	**1.25 (1.03-1.53)**	**0.023**
H	0.93 (0.68-1.26)	0.638	1.10 (0.81-1.51)	0.534
I	1.06 (0.87-1.30)	0.551	**1.28 (1.05-1.56)**	**0.014**
J	0.74 (0.60-0.91)	0.005	0.94 (0.76-1.16)	0.551
K	1.22 (0.99-1.50)	0.057	**1.23 (1.03-1.48)**	**0.026**
L	1.04 (0.87-1.24)	0.699	**1.36 (1.13-1.62)**	**0.001**
M	1.09 (0.84-1.41)	0.519	1.19 (0.94-1.49)	0.148
N	1.35 (1.12-1.64)	0.002	**1.35 (1.14-1.60)**	**<0.001**

Bold = statistically significant difference (p<0.05)

Variables adjusted for: age, area-level smoking rate, comorbidity, histology, overall stage, PET use, pal. care. consult, geri. consult, ED visit, LHIN of residence, diagnostic interval, and radiotherapy treatment volume. Except for LIHN of residence, no system variables were clinically significant.

CONCLUSIONS

After adjusting for patient, disease and treatment factors, LHIN of residence emerged as the *major health care system factor* associated with choice of treatment intent in stage III NSCLC. This variation remained in adjusted models, even as advances in radiotherapy and immunotherapy were adopted over time. Some practice variability can be expected at the margins, but the magnitude of difference in treatment patterns across LHINs should be investigated. Our study suggests possible opportunities to improve care outcomes in stage III NSCLC by addressing unexplained regional variation in care. Where variation is found to be inappropriate, remedies could include communities of practice, centralized or regional peer review, more frequent/standardized multidisciplinary decision-making, and increased regional knowledge translation.