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OncoHealth

Real-World Evidence Relating Cytopenia Diagnosis to Hospitalization and Cost of Care in the Treatment of Non-Small Cell Lung Cancer Patients

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BACKGROUND

Cytopenias (anemia, leukopenia, neutropenia, thrombopenia) are drivers of infection-related mortality in Non-Small Cell Lung Cancer (NSCLC) patients with chemotherapy-induced myelosuppression. Prior research found incident neutropenia in 24% of advanced NSCLC Medicare patients during first-line chemotherapy.[1] Cytopenia-related care comprised up to one-third of total patient cost[2] "with a mean hospital cost of $24,770 per stay"[3] for neutropenia in 2012.

OBJECTIVES

- Confirm real-world incidence of cytopenia in an NSCLC population using OncoHealth Real-World Data (RWD).
- Temporally sequence cytopenia diagnosis, hospitalization and accrual of costs.
- Stratify by age, sex, race, ethnicity, payer type, severity and type of cytopenia.
- Estimate characteristics of the subsequent hospitalizations and total cost of care.

METHODS

- A cross-sectional study measuring incident cytopenia, hospitalization and costs of care.
- 10,767 NSCLC patients initiating treatment from 2016–2022.
- OncoHealth RWD includes prior authorization, payer claims and unstructured data derived from clinical documentation.
- Cytopenia index date was confirmed using claims, lab values and observations within 30 days of initial diagnosis.
- Quantitative values were obtained to confirm anemia and thrombocytopenia; qualitative values confirmed neutropenia and leukopenia.
- Hospitalization and post-diagnosis total cost of care were calculated over 8 weeks pre- and post-cytopenia index date.
- Results were stratified by additional measurements and characterized.
- Between group differences were modeled using ANOVA.

RESULTS

- Index cytopenia diagnosis was first identified by claims (72%), labs (15%) or observation notes (13%).
- Cohort members had a mean age of 72 years, were 50% female, 57% Caucasian, and 89% had Medicare claims.
- 20% prevalence of cytopenia among OncoHealth NSCLC patients are comparable to the likely national prevelance.[1]
- Race/ethnicity information were available for 60% of patients.
- We stratified by the timing of 1st hospitalization from index cytopenia diagnosis (1, 1-2, >2 months, prior to index and none)
- Cost differences among hospitalization timing subgroups were not found to be significant until outliers ("super-utilizers") were removed from the analysis (1% of patients, N=30). Super-utilizers were defined as patients with a total cost over 8 weeks >2.5 SD per hospitalization subgroup.

Figure 1: Cytopenia Diagnosis Confirmation

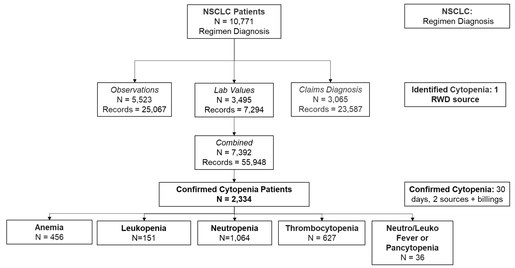

Table 1: Patient Characteristics

	N	Hospitalization Timing Subgroups N				
	Cytopenia Diagnosis	1 month	1-2 months	>2 months	Prior to Index	No hosp
NSCLC (N=10,767)	2,334	273	80	149	1,683	149
Age						
Years (Avg, SD)	71.5	72.8	75.5	73.8	72.5	73.3
Sex						
Female	1,142	127	35	71	841	68
Male	1,192	146	45	78	842	81
Race						
Asian	16	--	--	--	15	--
Black	253	32	14	14	186	--
Caucasian	1,330	169	41	79	975	66
Other	38	--	--	--	26	--
Unknown	697	70	24	49	481	73
Ethnicity						
Hispanic	194	14	--	--	138	28
Not Hispanic	975	126	33	57	707	52
Unknown	1,166	133	44	82	838	69
Payer Type						
Commercial	313	40	--	25	226	--
Medicaid	171	23	--	--	129	--
Medicare	2,081	215	70	112	1,340	131
Unknown	154	18	--	--	27	--

- Average costs per patient over 8 weeks following cytopenia diagnosis between hospitalization timing subgroups ranged between $28,054 to $115,226 (p=0.002).
- Costs increased by 18% and 24% for groups 1 and 4 during the index week, compared to the entire baseline 8 weeks, as a result of increased spending for inpatient stays, outpatient procedures, radiation therapy (RT) and supportive medications.
- Between baseline and index week, the proportion of costs increased for inpatient, outpatient, RT and supportive meds, while decreasing for chemotherapy, immunotherapy and targeted therapy.
- Patient ethnicity (p=0.038), cytopenia severity (p<0.002) and mortality (p=0.007) during the 8-week follow-up period were associated with significant differences in cost.
- Recent chemotherapy (p<0.002) and immunotherapy (p<0.0001) just prior to index cytopenia were associated with differences in cost between hospitalization subgroups.
- The precise timing of chemotherapy or immunotherapy prior to index cytopenia was not associated with cost differences. (Prior chemotherapy ranged 8.6 to 12.3 days, p=0.11; prior immunotherapy ranged 12.5 to 15.9 days, p=0.74).
- Receipt of prophylactic GCSFs was not associated with differences in cost (p=0.61).
- Age, sex, race, payer type and type of cytopenia were not significantly associated with differences in cost between hospitalization subgroups (p=0.19).

Table 2: Average Costs over 8 Weeks Following Cytopenia Index

Group	Overall				Super-Utilizers removed (n=30)			
	N patients	8 week average	SD	p-value	N patients	8 week average	SD	p-value
1- Hospitalized up to 1 month after cytopenia	267	$174,767	664,248		262	$94,201	147,758	
2- Hospitalized 1 to 2 months after cytopenia	72	47,114	52,615		67	40,639	46,430	
3- Hospitalized more than 2 months after cytopenia	131	35,064	50,858		124	28,054	39,852	
4- Hospitalized prior to cytopenia	1627	156,027	988,302		1620	115,226	343,509	
5- Not hospitalized	88	43,982	56,665		82	36,724	50,104	
Total	**2185**	**142,964**	**884,843**	**0.43**	**2155**	**102,348**	**303,842**	**0.002****

Figure 2: Average Costs per Patient per Week, Before/After Index

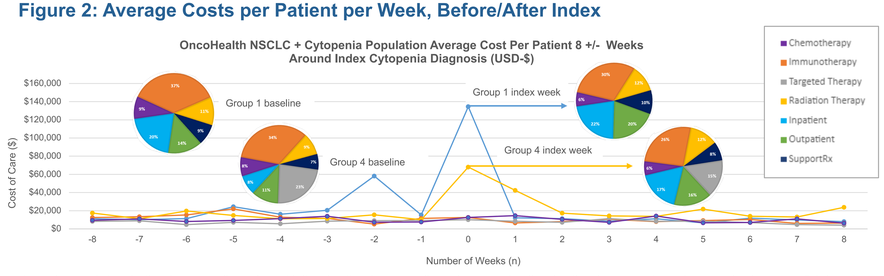

Table 3: Average Days between Hospitalization, Chemo/Immunotherapy and Cytopenia Index

Group	Immunotherapy (days)	Chemotherapy (days)	Hospitalization to Index (days)
1- Hospitalized up to 1 month after cytopenia	14.5	11.8	14.8
2- Hospitalized 1 to 2 months after cytopenia	12.8	8.6	44.8
3- Hospitalized more than 2 months after cytopenia	15.9	10.7	372.0
4- Hospitalized prior to cytopenia	13.8	12.3	-155.7
5- Not hospitalized	12.5	11.1	—

DISCUSSION

- Patients hospitalized within 1 month of index cytopenia experienced higher average costs over 8 weeks follow-up, compared to patients hospitalized at other times.
- Patients on immunotherapy or chemotherapy, with grade 1+ anemia or thrombocytopenia, and those who died were associated with higher costs.
- Immunotherapy and chemotherapy within the two weeks prior to cytopenia diagnosis appear to initiate higher costs.

LIMITATIONS

- Cross-sectional studies can provide information on patient exposures and outcomes but are inadequate for establishing causality.
- Incomplete lab reports limited severity measurements to anemia and thrombocytopenia.
- Costs summarized within the 8-week study period may not be directly related to the cytopenia diagnosis.
- Higher costs between groups may be subject to confounding by indication.
- We identified a subset of high-cost outlier patients with sufficient leverage to merit further exploration of associations following their exclusion (n=30).

CONCLUSION

The OncoHealth RWD reveals a cost spike associated with cytopenia diagnosis and hospitalization within one month. These data offer a basis for cost/benefit and causal modeling to further assess risks and symptom management opportunities for NSCLC patients who experience cytopenia. Future analysis can help with identifying a window of opportunity for patient intervention and cost containment.

REFERENCES

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