Comparative Effectiveness of Granulocyte Colony Stimulating Factor Utilization versus Chemotherapy Dose Reduction on Overall Survival: A Propensity Score Matched Analysis

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BACKGROUND

- Febrile neutropenia resulting from chemotherapy can lead to increased hospitalizations and mortality.[1]
- Current American Society of Clinical Oncology (ASCO) guidelines recommend use of Granulocyte colony stimulating factors (G-CSF) for prevention of febrile neutropenia among cancer patients with high risk.
- ASCO also recommends viable alternatives to G-CSF administration, of which chemotherapy dose reduction (CDR) is well suited as it may result in cost savings for patients and payers.[2]
- Evidence is lacking on value of G-CSF in metastatic tumors.

OBJECTIVES

The objective was to compare survival outcomes among

1) G-CSF treated vs G-CSF untreated patients and
2) G-CSF treated vs CDR treated patients.

METHODS

Study Design and Population: Retrospective cohort study with data obtained from the electronic medical records of patients with metastatic colorectal cancer who received chemotherapy at Texas Oncology between July 2013 and Dec 2014

Outcome Variable:

- Overall Survival: time from first day of chemotherapy to death of any cause or last clinic visit

Predictor Variable:

- G-CSF Use: at least one administration of G-CSF during study period
- Chemotherapy Dose Reduction: at least 10% reduction in at least one cytotoxic agent compared to standard dose

Covariates:

- age, gender, febrile neutropenia (FN) risk, line of therapy, disease (colon or rectal) and year of diagnosis

Analysis:

- Cohorts were matched on the covariates using 1:1 propensity score matching with logistic regression. The match algorithm used was caliper matching without replacement (caliper width:0.08). Paired t-tests and Mc Nemar's test were used to test for balance post matching.
- Kaplan-Meier and log-rank methods were used to assess survival. Conditional cox proportional hazards regression models were used to estimate the hazards.

RESULTS

Table 1: Characteristics of G-CSF treated vs G-CSF untreated patients (post-match)

Characteristic* N (%)	G-CSF Treated (N=235)	G-CSF Untreated (N=235)
Age, mean (SD)	59.9 (10.8)	58.9 (10.9)
Gender		
Male	124 (52.7)	127 (54.0)
FN Risk		
Low	104 (44.3)	109 (46.4)
Intermediate	131 (55.7)	126 (53.6)
Line of Therapy		
1st line	149 (63.4)	159 (67.6)
2nd line	74 (31.5)	68 (29.0)
Beyond 2nd	12 (5.1)	8 (3.4)
*all p-values >0.05		

Table 2: Characteristics of G-CSF treated vs CDR treated patients (post-match)

Characteristic* N (%)	G-CSF Treated (N=123)	CDR Treated (N=123)
Age, mean (SD)	66.3 (9.1)	66.9 (8.3)
Gender		
Male	63 (51.2)	65 (52.9)
FN Risk		
Low	60 (48.8)	61 (49.6)
Intermediate	63 (51.2)	62 (50.4)
Line of Therapy		
1st line	79 (64.2)	83 (67.5)
2nd line	35 (28.5)	32 (26.0)
Beyond 2nd	9 (7.3)	8 (6.5)
*all p-values >0.05		

- Pre-matching, there were 2048 unique observations in the data, with G-CSF treated (n=248) and CDR treated (n=280) patients.
- In the first model, the median survival for G-CSF treated vs G-CSF untreated patients was 26.1 and 27.6 months, respectively (p=0.2778).
- In the second model, the median survival for G-CSF treated vs CDR treated patients was 22.2 and 19.5 months, respectively (p=0.6886).
- The cox model showed no difference between G-CSF treated vs G-CSF untreated patients (Table 3).
- Likewise, there was no difference between G-CSF treated and CDR treated patients (Table 3).
- The Kaplan Meier survival curves are shown in Figures 1 and 2

Table 3: Conditional Cox Proportional Hazards Regression Results of the Cohorts

Models	Odds Ratio	95% CI
G-CSF treated vs G-CSF untreated	1.06	0.76, 1.46
G-CSF treated vs CDR treated	0.75	0.51, 1.12
CI: confidence interval		

Figure 1: Kaplan Meier survival curves between G-CSF vs no G-CSF cohorts

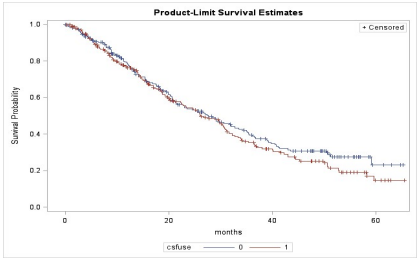
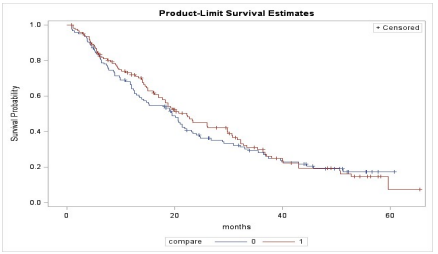


Figure 2: Kaplan Meier survival curves between G-CSF vs CDR cohorts



DISCUSSION

- The results show that G-CSF administration for patients with metastatic tumors may not be beneficial in terms of overall survival
- The CDR approach, which is more cost effective, should be adopted in lieu of G-CSF administration.
- These findings highlight an opportunity for payers and healthcare providers to reduce the cost of care while maintaining optimal health outcomes.
- These findings could inform policy makers and guide future evidence-based recommendations for G-CSF use, particularly for metastatic patients, where specific recommendations are lacking.

CONCLUSIONS

- There was no statistically significant difference in median or overall survival between G-CSF treated vs G-CSF untreated patients and between G-CSF treated vs CDR treated patients.
- This demonstrates no benefit of G-CSF use alone or G-CSF use over CDR in terms of overall survival.
- These findings could help reduce G-CSF overutilization and result in enhanced clinical practice and cost savings, without compromising health outcomes.

LIMITATIONS

- Possible coding inaccuracies in data due to data source: electronic health records
- Data missingness for the CDR variable (unstructured data)
- Incomplete matching due to match algorithm

REFERENCES

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