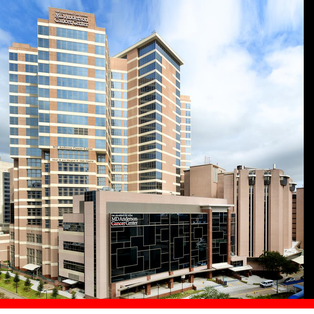

Cost-effectiveness of Chemotherapeutic Colon Cancer Regimens

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Background

The National Comprehensive Cancer Network recommends for high-risk stage II and stage III colon cancer patients to receive chemotherapy after colectomy.[1] There are currently multiple combination chemotherapy regimens available for colon cancer treatment. Decision of regimen is determined on an individual patient basis.[1] Not many studies have evaluated the effectiveness and financial costs of these regimens. Our study aims to evaluate these regimens in terms of both health outcomes and financial burden.

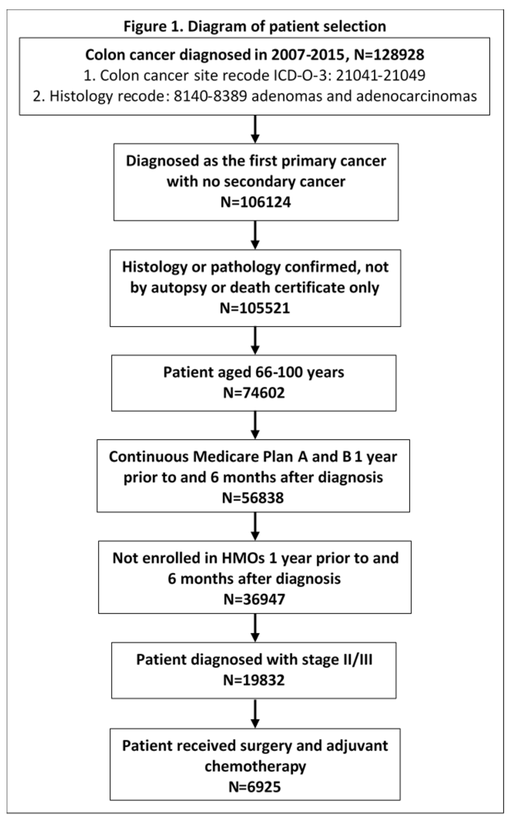
Research Question

Which chemotherapy regimen is the most cost-effective, meaning lowest average cost in comparison to the highest overall survival among patients?

Methods

We used the Surveillance, Epidemiology, and End Results (SEER) linked with Medicare database for this study. Patients 66-100 years old diagnosed with colon cancer between 2007 and 2015 who survived at least 6 months since diagnosis and received surgery followed by chemotherapy were included (cohort selection criteria is listed in Figure 1). We evaluated 4 types of regimens: 5-FU/LV (fluorouracil, leucovorin), capecitabine, FLOX (fluorouracil, leucovorin, oxaliplatin), and mFOLFFOX6 (folinic acid, fluorouracil, oxaliplatin). Regimen and total cost per patient were estimated. Linear regression was used to compare differences in mean costs. Patients' survival was estimated using the Kaplan-Meier method and a multivariable Cox regression model was used to compare survival among different regimens while adjusting for patient characteristics. All analysis was done in SAS EG 7.11.

Figure 1. Diagram of patient selection



Results

Table 1. Patients' characteristic distributions and median cost by regimens

Variables	5-FU/LV	Capecitabine	FLOX	mFOLFOX6	P
	n=993	n=1809	n=3799	n=324	
	row %	row %	row %	row %	
Stage					
II	19.10%	32.00%	44.80%	4.00%	<.0001
III	12.90%	24.40%	57.80%	4.90%	
Year of diagnosis					
2007	19.90%	21.20%	56.90%	1.90%	<.0001
2008	18.70%	20.30%	59.60%	1.40%	
2009	13.50%	21.40%	62.70%	2.40%	
2010	15.20%	24.90%	57.40%	2.50%	
2011	11.50%	28.50%	53.80%	6.10%	
2012	11.20%	27.30%	50.70%	10.70%	
2013	12.10%	30.80%	51.30%	5.80%	
2014	13.00%	29.20%	52.20%	5.50%	
2015	11.60%	34.60%	46.50%	7.30%	
Gender					
Female	14.80%	28.20%	52.50%	4.50%	<.0001
Male	13.80%	23.70%	57.60%	4.80%	
Duration of chemotherapy					
<=90days	19.20%	44.20%	33.00%	3.60%	<.0001
91-180days	12.70%	27.80%	54.40%	5.10%	
181-365days	18.50%	20.10%	55.60%	5.80%	
366+days	10.20%	15.20%	70.90%	3.70%	
Male	13.80%	23.70%	57.60%	4.80%	
Cost $ (Median)					
Regimen	5370.8	10022.9	27710.2	13684.8	*
Total	113277.8	109280.9	130304.2	115058.1	*

***P-value from ANOVA test was <0.05 for cost**

Figure 2. Kaplan-Meier Curve for Cause-specific Survival by Regimens Adjusted for Covariates

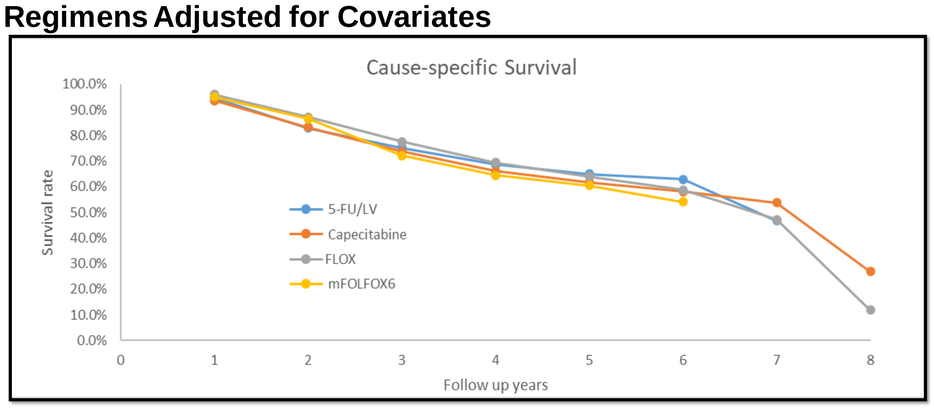


Table 3. Adjusted Survival Probabilities by Regimens*

Year	5-FU/LV	Capecitabine	FLOX	mFOLFOX6
1	94.6%	93.7%	96.1%	95.2%
2	82.9%	83.3%	87.3%	86.7%
3	75.2%	73.9%	77.7%	72.2%
4	68.7%	66.2%	69.5%	64.6%
5	65.0%	61.9%	64.0%	60.6%

Table 4. Association between cancer cause-specific survival and chemotherapy regimens in multivariable Cox Regression Model*

		Cause-specific Survival			
		Hazard Ratio	**95% CI**		**p-value**
Regimen	**5-FU/LV**	*ref*			
	Capecitabine	1.01	0.86	1.20	0.880
	FLOX	1.07	0.92	1.24	0.389
	mFOLFOX6	1.09	0.79	1.49	0.611

***Covariates adjusted in the multivariable model for Table 3 and 4 were: age, gender, race, region, education, income, Charlson comorbidity, stage, and treatment duration**

Relation to Cancer Prevention

Tertiary cancer prevention focuses on patients already affected by cancer progression. These patients have many needs including various treatments, therapies, and support. Our study aims to provide support and information to these patients about cost-effectiveness of various treatment options. To ensure quality of life after cancer remission, financial burden must be taken into consideration to encourage cancer treatment completion and leave fewer lasting effects of treatment.

Conclusion

Patterns of chemotherapeutic colon cancer regimen use have changed overtime as the FDA approved new drugs between 2007 and 2015. These changes resulted in 5-FU/LV decreasing over time in favor of newer treatments, and capecitabine increasing over time. Of the four regimens considered, 5-FU/LV had the lowest regimental costs. However, total cancer treatment costs were similar among the four regimens. There were no statistically significant differences in patients' survival comparing 5-FU/LV, capecitabine, FLOX, and mFOLFOX6.

Future Directions

To calculate quality-adjusted life-years (QALYs) and the incremental cost-effectiveness ratio (ICER) for the four regimens in order to directly compare cost-effectiveness.

Implications

Implications of this study affect patients, physicians, and drug development. This information can be used by physicians to inform patients of potential results of their treatment course, including financial burden. Affordable cancer treatment is essential to patient completion and positive health outcome in order to reach ideal survival.

Responsible Research Conduct

For this research project, the MD Anderson PI submitted a research protocol and obtained research approval. The PI was responsible for maintaining documents and approvals for all modifications in the protocol. Data security for patients was maintained and there were no conflicts of interest.

Acknowledgements

This study was supported in part by the NCI P30 CA016672, by the Duncan Family Institute as well as the NIH/NCI R25CA056452 (Emily Wood, Shine Chang) and by the NIH/NCI under award number P30 CA016672.

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