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The Rising Trend of Metastatic Colorectal Cancer: A Hospital-Based Study across Age Groups

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Abstract

Purpose: Metastatic colorectal cancer (mCRC) is a major contributor to cancer-related morbidity and mortality in the United States. Although colorectal cancer has traditionally affected older adults, emerging data suggest shifts in age-specific disease patterns. The purpose of this study was to evaluate age-stratified proportion of hospitalizations and temporal trends in hospitalizations for metastatic colorectal cancer using a nationally representative inpatient database to identify populations potentially underserved by current screening guidelines. **Methods:** A retrospective analysis of the National Inpatient Sample (NIS) from 2016 to 2019 was conducted. Hospitalizations with a diagnosis of mCRC were identified using ICD-10 codes. Patients were categorized into five age groups: ≤45, 46 - 55, 56 - 65, 66 - 75, 76 - 85, and ≥86 years. Descriptive statistics summarized proportion of hospitalizations, analysis of variance compared annual differences, and linear regression assessed temporal trends. Statistical significance was defined as $p < 0.05$. **Results:** A total of 426,025 hospitalizations were identified. Patients aged 66 - 75 years accounted for 73,070 cases and demonstrated a significant increase in proportion of hospitalizations from 24.62% in 2016 to 26.54% in 2019 ($p < 0.05$). Individuals aged ≤45 years and ≥76 years comprised approximately 29% of hospitalizations. **Conclusion:** Hospitalizations for metastatic colorectal cancer are increasing among adults aged 66 - 75 years, with a substantial burden also observed at age extremes. These findings suggest potential gaps in current screening strategies. These findings highlight age-specific disparities in hospitalization burden that may inform future screening and health system planning.

Keywords

Metastatic Colorectal Cancer, Age Groups, Epidemiology, Screening,

National Inpatient Sample, Temporal Trend

1. Introduction

Colorectal cancer is a leading cause of cancer-related deaths worldwide, with metastatic disease responsible for the majority of fatalities [1] [2]. While colorectal cancer has traditionally been seen as a disease affecting mostly adults aged 65 years and older, recent data shows a concerning rise in cases among younger individuals [2] [3]. This shift has prompted a reassessment of current screening and prevention strategies to better address changing risk patterns.

Global cancer surveillance data continues to highlight colorectal cancer as a significant public health challenge, with millions of new cases and deaths reported annually [1]. Focusing specifically on metastatic colorectal cancer (mCRC) is critical, as it represents the most advanced stage of disease and is frequently associated with poor prognosis, substantial morbidity, and limited therapeutic options [2]. Understanding how mCRC affects different age groups can guide efforts to improve early detection and tailor interventions more effectively.

Most epidemiologic studies rely on cancer registries, which provide valuable information about incidence and survival but may not capture detailed hospitalization data or reflect healthcare utilization patterns [4]. In contrast, inpatient hospitalization data offer a unique perspective by revealing trends in severe disease requiring hospital care, associated comorbidities, and resource use. This approach can help identify populations with the greatest clinical burden and inform strategies to optimize management and outcomes.

Recent changes in colorectal cancer screening guidelines reflect growing recognition of shifting disease patterns across age groups. In the United States, the U.S. Preventive Services Task Force currently recommends routine colorectal cancer screening for average-risk adults beginning at age 45 years and continuing through age 75 years, with individualized decision-making for adults aged 76 - 85 years based on overall health and prior screening history [5] [6]. Recommended screening modalities include colonoscopy, fecal immunochemical testing (FIT), and stool DNA-based tests, among others. Despite these recommendations, screening uptake remains variable across age groups, potentially contributing to delayed diagnosis and advanced-stage disease at presentation [7].

In this study, we used a large, nationally representative inpatient database to evaluate age-specific trends in metastatic colorectal cancer from 2016 to 2019. By examining these patterns, we aim to identify populations that may benefit from more targeted screening and early detection efforts.

2. Methods

2.1. Data Source

The National Inpatient Sample (NIS), the largest publicly available all-payer inpa-

tient healthcare database in the United States, was utilized for the years 2016 through 2019. The NIS is maintained by the Agency for Healthcare Research and Quality as part of the Healthcare Cost and Utilization Project and represents approximately 20% of all inpatient hospitalizations nationwide. Discharge-level sampling weights were applied to generate nationally representative estimates.

2.2. Study Population

Hospitalizations with a primary or secondary diagnosis of metastatic colorectal cancer were identified using International Classification of Diseases, Tenth Revision (ICD-10) diagnosis codes. Metastatic disease was defined by the presence of secondary malignant neoplasm codes in conjunction with colorectal cancer diagnosis codes. Patients were stratified into the following age groups: ≤45 years, 46 - 55 years, 56 - 65 years, 66 - 75 years, 76 - 85 years, and ≥86 years.

2.3. Statistical Analysis

Descriptive statistics were used to summarize the proportion of hospitalizations across age groups. Analyses incorporated NIS discharge weights, strata, and clustering variables to account for the complex survey design. Temporal trends were assessed using analysis of variance and linear regression modeling. A two-sided p value < 0.05 was considered statistically significant. All analyses were performed using IBM Statistical Package for the Social Sciences (SPSS) Statistics, version 26.0.

2.4. Ethics Statement

This study used publicly available, de-identified data and was exempt from institutional review board approval.

3. Results

3.1. Patient Characteristics and Demographics

Between 2016 and 2019, a total of 426,025 hospitalizations with a diagnosis of metastatic colorectal cancer (mCRC) were identified in the National Inpatient Sample. Age-stratified distributions were examined to assess demographic patterns over the four-year study period.

3.2. Age Distribution of Metastatic CRC Cases

The proportion of mCRC hospitalizations varied across age groups, with middle-aged and older adults accounting for the majority of cases (Table 1). Patients aged ≤45 years consistently represented the smallest proportion of hospitalizations, with a slight decrease from 9.86% in 2016 to 8.97% in 2019. Hospitalizations among patients aged 46 - 55 years remained relatively stable, accounting for 17.38% to 18.18% of cases annually.

Patients aged 56 - 65 years accounted for the largest proportion of mCRC hospitalizations throughout the study period, representing approximately 27% of

cases annually. Although a modest decline was observed from 28.04% in 2016 to 27.21% in 2019, this age group remained the most affected overall.

Table 1. Age distribution of metastatic colorectal cancer hospitalizations by year, 2016-2019.

Age Group	Year			
	2016 (%)	2017 (%)	2018 (%)	2019 (%)
≤45 years	9.86	9.43	9.55	8.97
46 - 55 years	18.02	17.38	18.18	17.44
56 - 65 years	28.04	27.39	26.89	27.21
66 - 75 years	24.62	26.54	25.98	26.16
76 - 85 years	14.53	14.57	14.51	15.61
≥86 years	4.93	4.69	4.89	4.62

a. Values represent weighted percentages of hospitalizations with metastatic colorectal cancer derived from the National Inpatient Sample.

Patients aged 66 - 75 years constituted the second-largest proportion of hospitalizations and demonstrated an increasing trend over time, with proportions rising from 24.62% in 2016 to 26.54% in 2019. Patients aged ≥ 76 years accounted for approximately 14% - 16% of hospitalizations annually, with relatively stable proportions across the study period.

3.3. Subgroup Observations

Hospitalizations among patients aged ≤ 45 years comprised a small but persistent proportion of mCRC cases over time. In contrast, patients aged 66 - 75 years demonstrated both a high proportion of hospitalizations and a notable temporal increase in hospitalizations. Patients aged ≥ 76 years also represented a substantial share of cases, highlighting the continued burden of metastatic colorectal cancer in older populations.

3.4. Temporal Trends

Patients aged 66 - 75 years demonstrated a statistically significant increase in the proportion of metastatic colorectal cancer hospitalizations, rising from 24.62% in 2016 to 26.54% in 2019 ($p < 0.05$) (**Figure 1**). Patients aged ≤ 45 years and ≥76 years collectively accounted for approximately 29% of metastatic colorectal cancer hospitalizations across the study period.

4. Discussion

This study demonstrates a sustained and increasing burden of metastatic colorectal cancer among adults aged 66 - 75 years. This increase may reflect both true epidemiologic change and cohort aging, as the Baby Boomer generation transitions into the 66 - 75 age bracket. In addition, nearly one-third of metastatic cases

occurred in patients aged ≤ 45 years or ≥76 years, underscoring a substantial burden of advanced disease among age groups that fall outside routine colorectal cancer screening recommendations, which in the United States generally target adults aged 45 - 75 years.

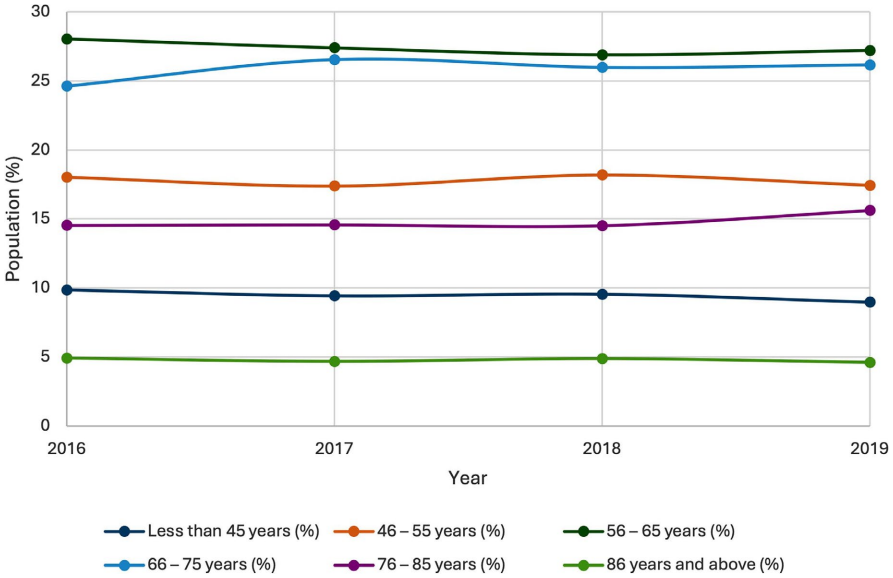

Figure 1. Temporal trends in age-specific metastatic colorectal cancer hospitalizations from 2016 to 2019.

Multiple factors may hypothetically contribute to delayed diagnosis across these populations, although such mechanisms cannot be directly assessed using administrative inpatient data. In older adults, potential contributors include procedural risk, comorbidity burden, and reduced adherence to colonoscopy-based screening, which may limit timely detection. Conversely, younger individuals may experience diagnostic delays related to lower clinical suspicion and reduced awareness of colorectal cancer risk. Emerging noninvasive screening modalities, including circulating tumor DNA assays and liquid biopsy technologies, have shown promise in detecting colorectal cancer and may offer age-tailored strategies that improve screening uptake and early diagnosis [8]-[10].

Several limitations should be considered. This analysis was retrospective and relied on administrative data, precluding assessment of tumor biology, treatment patterns, screening history, or survival outcomes. Because the National Inpatient Sample captures inpatient encounters only, these findings reflect the burden of hospitalizations rather than the total population-level burden of metastatic colorectal cancer. A substantial proportion of metastatic colorectal cancer management occurs in outpatient settings, which are not represented in this dataset and may lead to underestimation or differential characterization of disease burden across age groups. Despite these limitations, the use of a large, nationally representative inpatient dataset provides valuable insight into age-specific hospitalization trends for advanced colorectal cancer.

5. Conclusion

Metastatic colorectal cancer affects a broad age spectrum, with a substantial and persistent burden among adults aged 56 - 65 years and a rising burden among those aged 66 - 75 years, alongside a notable proportion of hospitalizations occurring at younger and older age extremes. These findings highlight potential gaps in current screening strategies and underscore the importance of age-aware approaches to early detection and healthcare planning.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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