Research Article

The impact of age on multi-disciplinary team access and decision-making for patients diagnosed with colorectal cancer: a single regional hospital experience

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Abstract
Objective: *To explore whether age impacts on multidisciplinary team (MDT) access and/or decision-making for patients diagnosed with colorectal cancer (CRC) in a regional setting.*

Methods: *A retrospective audit of factors (identified from a systematic literature review) that impact on the CRC MDT. Data collected included non-identifying demographics, CRC stage, MDT referral outcomes and other treatment decision-making variables.*
Setting and participants: All patients with a CRC diagnosis (2010-2019) admitted to a single regional public hospital (n=449) in South Australia.

Main outcomes measures: *Key study factors were compared for younger (<75 years) and older age (>=75 years) at diagnosis.*

Results: *For eligible patients (n=335), 87% of patients were referred to a MDT, with no difference between older (84%) and younger (89%) patients (n=335, p=0.343). However, for patients with advanced CRC (Stage III-IV), older patients were less likely to be referred to MDT (87% vs 96%) (n=164, p=0.045). Age-related MDT referral difference was also observed for patients with more complex disease (advanced stage plus comorbidities) (85% older vs 97% younger) (n=113), p=0.049). Although MDT adjuvant therapy recommendations were less likely for older patients with complex disease, there was no difference between older and younger patients without comorbidities (53% vs 57%, respectively) (n=61), p=1.000).*

Conclusions: *Age did not appear to predict MDT access, but age-related disparities were evident for patients with advanced CRC +/- comorbidities. These findings might partly account for evidence of slower rates of CRC survival increases for older compared to younger patients.*

Key Question Summary

What is already known on this subject?

1. Treatment inequalities for older patients with CRC and rural-urban disparities in time to treatment exist.
2. CRC survival improvement is increasing at a slower rate for older (>65 years) compared to younger patients.
3. Evidence from linked population-based datasets suggests that older patients (>70 years) are less likely to be discussed by a multidisciplinary team (MDT) or receive guideline recommended care.

What this paper adds?

1. Our retrospective audit suggests that age per se does not predict MDT access when patients with a CRC diagnosis had no evidence of other comorbidities.
2. Age-related disparities were evident for patients with advanced or complex CRC being less likely to be referred to a MDT or receiving best practice recommendations.
3. Our findings emphasise the benefits for older patients from being reviewed by appropriately designed MDTs tailored to the complexity of ageing.

Introduction

Colorectal cancer (CRC) is a disease of older people with increasing incidence rates with age from 2.8 (per 100,000) in the age group of 20-24 to 421.3 (per 100,000) in the 80-84 year-old cohort, recording a median age at diagnosis of 70 years [1]. Early CRC diagnosis and access to best practice care achieves optimal cancer outcomes with CRC survival improvements observed over recent decades [2]. However, there is evidence that treatment inequalities exist for older patients [3-5] and survival is increasing at a slower rate for older (>65 years) compared to younger patients [6,7], despite the 5-year observed CRC survival rate being similar across remoteness areas [1]. Although the reasons for poorer cancer survival in older people are complex, evidence suggests that older patients are less likely to receive best practice care [8].

Multidisciplinary team (MDT) care is recognised as the cornerstone of best practice in treatment planning and care for patients with cancer. The MDT meeting (also referred to as tumour board meetings) allows for a broader assessment, with the benefits of peer review, of medical and societal factors that may impact treatment outcomes. MDT care is the accepted model of CRC care in healthcare settings around the world including in the USA [9] and Europe [10]. In Australia, the MDT is a key focus for patients who are referred into the acute sector with a CRC diagnosis in both metropolitan and regional settings [11].

A growing body of evidence is emerging about the value of MDT cancer care in treatment planning and care for older patients across numerous disease sites [12,13], including CRC [4,14]. Clinical decision-making for older people with a cancer diagnosis is often complicated due to a range of other pre-existing medical factors, such as increased frailty and co-morbidities, and societal factors, especially for patients living in regional settings [5,15].

Transport limitations and isolation from usual support networks are challenges for patients from rural Australia [11]. While the MDT meeting allows discussion of a management strategy without presumption, evidence from linked population-based datasets suggests that older patients (>70 years) are less likely to be discussed by a multidisciplinary team (MDT) [16,17], or receive guideline recommended care [17-19]. A range of complex patient, physician and/or system-level factors may influence older patients' access to MDT care and determine MDT treatment recommendations [20].

Hospital location and size have been identified as system-level factors that may impact on MDT access [20]. These barriers are compounded by the inconsistent, or lack of, definition of 'older people' in clinical practice guidelines [21]. For example, even though Australian clinical practice guidelines for the management of CRC define older patients as 70 years or older, these patients are often under-represented in clinical trials [22,23], leading to limited evidence-based recommendations for this subgroup of patients. Consequently, chronological age may sometimes be relied on as a proxy indicator of other medical factors (such as frailty, complex co-morbidity) [8]. Such clinical presumptions may result in altered treatment strategies and disadvantage some older patients who would otherwise benefit from cancer treatment [24].

Little is known about why age-related disparities in CRC survival outcomes exist. The reported CRC survival rates are higher in younger patients compared to older cohort and age-related disparities in survival improvement is likely multifactorial [7]. Acknowledging the above, we hypothesise that chronological age may impact on access to quality cancer care, potentially via MDT access and/or MDT decision-making, and contribute to smaller survival gains for older patients diagnosed with CRC. The primary aim is to explore the impact of age on MDT access and decision-making in a regional setting, where the impact of age may be magnified.

Methods

Study Design

A retrospective audit of all patients with a diagnosis of CRC who were admitted to a single outer regional public hospital in South Australia between July 2009 and June 2019 was performed.

Patient Eligibility and Data Collection

Patients were eligible for inclusion when a 'colorectal cancer' coding as the primary diagnosis was identified in their discharge letter. Patients included were aged over 18 years at the time of diagnosis, and either had histological confirmation of CRC or radiological, endoscopic findings consistent with primary colonic/rectal malignancy. Admissions for the same episode of care were considered as one patient case. Patients with cancers originating from other sites or minimal clinical records were excluded (Table 1).

One investigator extracted de-identified data from the electronic hospital patient management system (Open Architecture Clinical Information System, OACIS). Data collection was managed using REDCap (Research Electronic Data Capture), a secure, web-based application [25]. Data were collected by review of clinical documents including MDT summaries and hospital discharge letters and manually entered into a purpose-designed REDCap data collection tool. MDT discussion date and referral outcomes were confirmed by an independent review of hard-copy MDT summaries.

Table 1: Study selection.

	N (%)
Total number of records	449
Duplicated records	6
Cancers originating from other sites	6
Admission for same episode of care	94
Out of project period	1
Incomplete records	7
Total number included in audit	335

Study Variables

Variables collected were based on a recent systematic review that identified predictors of MDT access and those that influenced MDT decision-making for older patients diagnosed with CRC [20]. Data collected included non-identifying demographics, CRC diagnosis and staging, MDT referral outcome, treatment decision-making variables, hospital admission including surgery and actual treatment received. For MDT access, discussion date was determined along with treatment recommendation and intent.

Patient baseline demographic characteristics which are likely to influence treatment decision-making included lifestyle factors, functional status and medical comorbidities (+/-polypharmacy). Information on CRC comprised of age at diagnosis, evaluation such as radiological and endoscopic workup, tumour staging as well as CRC-related hospital admissions.

Statistical Analysis

Descriptive statistics (counts and percentages) were calculated for all variables. A Fisher's exact test was performed to determine if there was an association between study variables and age. Key study variables were compared to age at diagnosis (younger (<75 years) vs older (>=75 years) patients). Results were considered statistically significant at $P<0.05$.

Results

A total of 449 patients were identified with diagnosis of CRC requiring admission between 2010 to 2019. Of these, 335 patients met the eligibility criteria for inclusion: 94 patients were excluded due to having multiple admissions for the same episode of care, and six patients were excluded as they had cancers originating from other sites (Table 1).

Patient and Admission Characteristics

Baseline characteristics for eligible patients are described in Table 2. Of the 335 patients included in the audit, the median age was 71 years (range, 40-96 years), with slightly more males (n=196, 59%) than females (n=139, 41%) included, although there was no significant gender difference across age groups (n=335, p=0.219) (Table 2). For cases where information was available, more older patients reported having no support network (single/widowed), be admitted for emergency procedures and present with co-morbidities (+/- polypharmacy) (Table 2). Complete preoperative staging was available for 78% of cases (n=261), with no difference across younger and older age groups (p=1.000). About two thirds of both older and younger patients were admitted with more advanced CRC (stage III-IV) at diagnosis (Table 2). There was no information available on lifestyle factors and functional status for most cases included (90% and 83% respectively), with no difference across age groups. Frailty and comprehensive geriatric assessments were only recorded for four cases, limiting further analysis.

Table 2: Study characteristics.

	< -75 years N (%)	>=75 years N (%)	P
Total number included in audit	192 (52%)	143 (43%)	
Gender (n=335)	-	-	0.219
Male	118 (61%)	78 (55%)	
Female	74 (39%)	65 (45%)	
Support network (n=268)	-	-	0.008

Single/widowed	48 (31%)	56 (50%)	
Married/defacto	107 (69%)	57 (50%)	
Admission type (n=321)	-		0.033
Elective admission	141 (76%)	88 (65%)	
Emergency presentation	44 (24%)	48 (35%)	
Tumour stage at diagnosis (n=261)	-	-	0.847
Stage I-II	55 (37%)	42 (38%)	
Stage III-IV	95 (63%)	69 (62%)	
Co-existing illness (n=335)	-	-	0.002
Comorbidities +/- polypharmacy	112 (58%)	107 (75%)	
No evidence of comorbidities stated	80 (42%)	36 (25%)	

MDT Access

At this single site, 87% (n=290) of patients were referred to the MDT. A range of patient-level factors were explored to determine the impact on referral to the MDT (Table 3a). In terms of MDT access, there was no significant difference based on gender or emergency presentation for older and younger patients (Table 3a). However, for patients with advanced CRC (Stage III-IV), older patients were less likely to be referred to MDT (87% vs 96%) (n=164, p=0.045). Similarly, older patients with more complex disease (defined as advanced stage and comorbidities) were also less likely to be referred (85% vs 97%, respectively) (N=113) p=0.049) (Table 3a). However, age did not influence MDT referral when patients with a CRC diagnosis had no evidence of other comorbidities (78% (older) vs 88% (younger) (n=116) p=0.266) (Table 3a).

MDT Decision-Making

Of the 290 patients who were referred to an MDT, treatment recommendation was missing on 18 patients (including five that were referred to another site for treatment). Where information was available (n=272), no active treatment was planned for 23 patients (8%) with no difference between older and younger groups.

Neither the treatment type proposed (surgery vs chemo/radiotherapy) nor the treatment intent (adjuvant vs curative) was different between older and younger patients in this setting (Table 3b). However, when presenting with complex disease, MDT adjuvant therapy recommendations were less likely for older patients (36% (older with complex disease) vs 58% (younger with complex disease) (n=90, p=0.026) (Table 3b). This difference was not observed for both subgroups of patients without comorbidities (53% vs 57%) (n=61, p=1.000).

Recommendations for palliative care, or no active treatment planned were not different between older and younger cohorts (53% vs 57%, respectively) (N=122, p=0.251).

Table 3: MDT access (a).

	< 75 years N (%)	>=75 years N (%)	P
a) MDT Access	-	-	0.343
Referral to MDT	170 (89%)	120 (84%)	
No MDT referral	22 (11%)	23 (16%)	
Gender (n=290)	-	-	0.054
Male	106 (61%)	61 (55%)	
Female	64 (39%)	59 (45%)	
Emergency presentations (n=92)	-	-	0.615
Referral to MDT	36 (82%)	37 (77%)	
No MDT referral	8 (18%)	11 (23%)	
Advanced cancers (Stage III-IV) (n=164)	-	-	0.045
Referral to MDT	91 (96%)	60 (87%)	
No MDT referral	4 (4%)	9 (13%)	
Complex disease (advanced stage plus comorbidities (n=113)	-	-	0.049
Referral to MDT	56 (97%)	47 (85%)	
No MDT referral	2 (3%)	8 (15%)	

No evidence of comorbidities stated (n=116)	-	-	0.266
Referral to MDT	70 (88%)	28 (78%)	
No MDT referral	10 (13%)	8 (22%)	

Table 3: MDT decision-making (b).

b) MDT recommendation	>=75 years N (%)	<75 years N (%)	P
Treatment type proposed (n=196)			
Surgery	24 (21%)	26 (32%)	0.099
Chemo/radiotherapy	90 (79%)	56 (68%)	
Treatment intent (n=150)			
Adjuvant	54 (57%)	23 (41%)	0.064
Curative	40 (43%)	34 (59%)	
Treatment intent for patients with complex disease (n=90)			
Adjuvant	28 (58%)	15 (36%)	0.026
Curative	20 (42%)	27 (64%)	
Treatment intent for patients with no evidence of comorbidities (n=61)			
Adjuvant	26 (57%)	8 (53%)	1.000
Curative	20 (43%)	7 (47%)	

Discussion

Our retrospective analysis examines MDT access and decision-making for older patients with CRC in a regional setting as we hypothesised that chronological age, exaggerated by rurality, may impact on access to quality of care, potentially contributing to the observed age-related disparities in CRC survival. The survival improvement in CRC is occurring at a slower rate for older patients when compared to the younger cohort [6,7]. Our study identified that age did not appear to predict MDT access at this single regional hospital. However, age-related disparities were evident for patients with advanced CRC +/- comorbidities as we have observed reduced rate of MDT referral in this population compared to their younger counterparts. This observation may explain age-related disparities in CRC survival arising from a conflation of age with chronic disease.

In terms of baseline demographics, our analysis revealed a significant difference in support network between younger and older patient cohorts, where higher proportion of patients were single/widowed in the latter group, as expected. Social isolation and lack of a community support system, particularly in regional settings, may lead to late presentation and diagnosis. This may explain the significantly higher proportion of older patients presenting with acute complications secondary to their cancers. They may require emergency procedures, which is associated with poorer outcomes while current literature also suggesting emergency surgery as a negative factor on MDT access [20,26]. Social support is important considering rural residence is associated with longer time to diagnosis and treatment [27]. In contrast, access to a support network might facilitate earlier medical evaluation and diagnosis for younger patients, thus indirectly contributing to age-related disparities in CRC survival outcomes.

Overall, no difference was identified in MDT access between younger and older cohorts at this single regional hospital. Our finding contrasts with our recent systematic review [20] that confirmed age as a significant predictor for access to MDT, with advanced age negatively influencing MDT access. Analysis of MDT access at a single hospital site may explain in part the difference between our observational study and the broader literature [20]. Hospital variation as a system-level factor may make a small contribution to MDT access, particularly for small sites with limited resource [16,20]. The hospital site selected in our study, despite being in a regional setting, has a large case load and significant MDT capability to support a vast geographical region that may account for our observation.

However, our analysis has shown age-related disparities in MDT access when older patients present with advanced malignancy or complex disease (Table 3). This finding is consistent with the literature as complex medical history has been shown to be a significant negative predictor for MDT access [20]. Conversely, advanced disease (stage III-IV) was identified as a positive factor influencing MDT access according to our recent systemic review [20], contradicting our findings whereby older patients with advanced disease were less likely to be referred to MDT as compared to the younger cohort.

For MDT decision making, this study demonstrated that there were fewer adjuvant therapy recommendations for older patients, especially in patients with comorbidities, which is consistent with other studies [17,28,29]. However, we found no significant difference for both older and younger patients without comorbidities. This is an important observation to highlight the complexity in treatment decision-making for older patients. Chronological age is an important factor in influencing the MDT

care process but other determinants, including performance status, frailty and presence of comorbid disease, require careful consideration.

Our study has several limitations. Firstly, this clinical audit focused on a single regional public hospital in South Australia and thus, our findings may not represent other regional sites across Australia. The retrospective methodology and number of patients included in the study also limit its power. This audit which was based on case note review may not fully capture the MDT discussion and decision-making process. It was notable that many social factors (e.g. lifestyle and functional status) considered important in the MDT decision-making process were not collected in the audit, with a lack of information recorded in the patient management system. Further studies using linked datasets are needed to better understand the range of factors that may impact on the MDT decision-making process [16]. The study also points to the need for qualitative research to explore patient choice as a contributing factor to the MDT referral and decision process especially in relation to issues of co-morbidity and social support. The survival data was not captured through our retrospective study which further limits our analysis. This information may provide insight into whether MDT access and decision-making contribute to improved survival outcome, narrowing the age-related disparities in survival improvement between older and younger patients.

Conclusion
Overall, this retrospective study found that in this regional setting, age itself does not affect MDT access. However, age combined with stage of disease and comorbidity may play a role. This is counterintuitive in that older patients with advanced stages of malignancy and complex comorbidity will likely benefit from a MDT discussion assisting decisions on treatment choice and whether therapy is appropriate. Further work is necessary to ensure that older patients are reviewed by appropriately designed MDTs tailored to the complexity of ageing. Removing clinical presumptions about age are expected to improve patient outcomes and ensure that some older patients who would otherwise benefit from cancer treatment are not disadvantaged on chronological age alone.

Declarations
Funding
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Availability of Data and Material
The data that support the findings of this study are stored on a secure server, administered through SAHMRI. Access to the data is available on request via the corresponding author (CAH). The data are not publicly available due to ethical approval restrictions with them containing information that could compromise research participant privacy/consent.

Author Contributions
Authors are part of research collaboration for a mixed methods research program aimed at exploring the impact of age on the MDT clinical decision-making process in the context of colorectal cancer management for older patients. The findings from this clinical audit are part of this broader research program.

CY (first author, and medical oncologist in training) was involved in the development and testing of the data collection instrument, data collection, clinical interpretation and lead the manuscript preparation. CAH was involved in the conception and study design, gaining funding and ethics approval, coordinated the project, development and testing of the data collection instrument, provided insight to data analysis and helped draft the manuscript. EB performed statistical analyses and interpretation and helped draft the manuscript. DP, MW, NS and TP provided access to the MDT process, clinical interpretation and manuscript preparation. DR, DT and JR provided input into the study design, result interpretation and manuscript preparation. TP was involved in the conception and study design, gaining funding and ethics approval, oversaw the project, and helped to draft the manuscript.

All authors have reviewed and approved the final submitted version of the manuscript and agree with the content and to the article's submission.

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