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Comprehensive Geriatric Assessment–Based Multidisciplinary Decision-Making in Octogenarians with Colorectal Cancer

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Abstract

Methods

We conducted a prospective observational study including patients aged ≥ 80 years with colorectal cancer (CRC) initially considered candidates for curative surgery at a tertiary hospital between 2018 and 2022. All patients underwent CGA performed by the same experienced geriatrician, supported by a specialised geriatric nurse. Based on multidimensional assessment, patients were classified into four CGA-based geriatric groups: fit (Type 1), pre-frail (Type 2), frail (Type 3), and dependent or poor prognosis (Type 4). Final treatment recommendations were established by a multidisciplinary tumour board. The primary outcome was the association between CGA-based geriatric classification and final multidisciplinary treatment recommendation.

Results

A total of 184 patients (mean age 84.1 ± 4.3 years) were included. Following CGA, 45.1% were Type 1, 29.5% Type 2, 19.6% Type 3, and 6.0% Type 4. Treatment recommendations differed markedly across CGA-based geriatric groups ($p < 0.001$). The proportion undergoing surgery decreased from 93.2% in Type 1 patients to 18.2% in Type 4 patients, whereas palliative treatment increased progressively. Treatment refusal occurred in 11% and was most frequent among patients classified as Type 3. In multivariable analysis, CGA-based classification remained independently associated with treatment recommendation after adjustment for age, sex and comorbidity.

Conclusions

In octogenarians with CRC considered for curative surgery, CGA-based geriatric classification was strongly associated with final multidisciplinary treatment recommendations. Beyond risk stratification, CGA provides clinical information that may facilitate personalized treatment selection and shared decision-making.

Key summary points

Aim: To evaluate whether CGA-based geriatric classification is associated with final multidisciplinary treatment recommendations in octogenarians with colorectal cancer.

Findings: Among 184 octogenarians initially considered candidates for curative surgery, surgical treatment decreased from 93.2% in Type 1 patients (fit) to 18.2% in Type 4 patients (dependent or poor prognosis), while palliative treatment increased from 0% to 81.8% ($p<0.001$). CGA-based geriatric classification remained independently associated with surgical decision-making after adjustment for age, sex, and comorbidity.

Message: CGA-based geriatric classification may support individualized multidisciplinary treatment decision-making in octogenarians with colorectal cancer.

Introduction

Colorectal cancer (CRC) is one of the most common malignancies, ranking second in terms of incidence (10.2%)[1]. In Spain, it constitutes a major public health problem, particularly among the older population, in whom the incidence is notably high[2]. Of the approximately 38,000 CRC cases diagnosed annually, 42% occur in patients older than 75 years. Furthermore, a 76% increase in the incidence within this age group is projected by 2045[3].

Surgery remains the treatment of choice for non-metastatic disease, regardless of patient age. Consequently, owing to population ageing, there has been a substantial rise in the number of older patients undergoing surgery for CRC. Data from the Healthcare Cost and Utilization Project Nationwide Inpatient Sample, which includes over one million patients who underwent CRC surgery, show that the majority (64%) were older than 65 years, 29% were older than 70 years, and 23% were octogenarians or nonagenarians[4].

Clinical decision-making in older patients represents a major challenge due to the considerable heterogeneity within this group. This complexity is particularly relevant in the oncological setting, where factors such as frailty, comorbidity, and functional status may influence both surgical indication and outcomes. As a result, a lower surgical rate has been reported among older patients—regardless of their baseline condition—which may negatively affect survival[5]. Conversely, failure to detect frailty may expose patients to treatments from which they are unlikely to benefit and which may even prove harmful[6].

For this reason, several scientific societies, including ASCO [7] and SIOG[8], recommend comprehensive geriatric assessment (CGA) incorporating frailty screening, with the aim of identifying vulnerability and optimising therapeutic decision-making. However, CGA is still not fully integrated into routine oncological practice, and the involvement of geriatric services in multidisciplinary teams remains limited. In addition, there is no consensus or common language for measuring frailty. Moreover, frailty assessment is often simplified by relying on a single tool, potentially losing the multidimensional perspective and interventional potential of CGA[9].

Despite these recommendations, there is limited evidence on whether frailty stratification based on CGA actually influences surgical decision-making in clinical practice among octogenarian patients with CRC.

The aim of this study was to evaluate the contribution of CGA-based classification and multidisciplinary treatment decision-making in octogenarian patients with CRC.

Material and methods

Study design and population

This was a prospective observational cohort study conducted at tertiary hospital in Madrid (Spain) between November 2018 and November 2022. All consecutive patients aged 80 years or older with a diagnosis of CRC who were referred for surgical intervention were included. Patients who underwent emergency surgery for complications related to CRC and those with unresectable tumours were excluded. Following the diagnosis of CRC, all patients were assessed by a colorectal surgeon and were initially considered candidates for curative surgical treatment. They were subsequently referred to the Geriatric Outpatient Clinic, where a CGA was performed before final multidisciplinary treatment decision-making. Importantly, inclusion was restricted to patients who had initially been considered suitable candidates for curative colorectal surgery by the colorectal surgery team. Therefore, the study specifically evaluated how the incorporation of CGA into the multidisciplinary decision-making process was associated with the final treatment recommendation.

Comprehensive Geriatric Assessment (CGA)

All patients underwent a preoperative CGA performed by the same consultan geriatrician, together with a specialized geriatric nurse. The assessment included multiple domains

- Clinical variables: age, sex, comorbidity (measured using the Cumulative Illness Rating Scale-Geriatric, CIRS-G) [10], and chronic medication. Severe comorbidity was defined as a score ≥ 3 in at least two organ systems.
- Functional status: evaluated using the Functional Ambulation Categories (FAC), Barthel Index and Lawton–Brody scale.
- Cognitive status: assessed with the Global Deterioration Scale (GDS) and the Pfeiffer Short Portable Mental Status Questionnaire (SPMSQ).
- Nutritional status: determined by body mass index (BMI) and the Mini Nutritional Assessment Short Form (MNA-SF) [11].
- Social context: recorded according to living situation and the presence of social support.
- Frailty was assessed using a multimodal approach, combining physical performance measures and validated frailty instruments, including the Short Physical Performance Battery (SPPB), gait speed, handgrip strength with a Jamar® hydraulic dynamometer, Clinical Frailty Scale (CFS) [12], FRAIL scale [13], and Frail-VIG index [14]. The frailty cut-off points were defined according to the previously established values: SPPB ≤ 9, walking speed ≤ 0.8 m/s, grip strength ≤ 12 kg in women and ≤ 22 kg in men (Peñagrande Cohort, local reference population) [15], CFS ≥ 5, FRAIL score ≥ 3 and Frail-VIG index ≥ 0.2.

Geriatric Clinical Classification

Patients were classified into four groups based on an overall assessment following an analysis of all the domains evaluated (functional and cognitive status, frailty, nutritional status, social status, etc.). An

expert geriatrician's overall assessment of all this information enabled the patient to be classified[16][17]

- Type 1 (Fit): patients with no evidence of frailty or significant comorbidities and with an acceptable life expectancy. Candidate for standard treatment, similar to younger adults.
- Type 2 (Pre-frail): Patients with deficits that could be corrected through geriatric intervention. The patient presents signs of mild frailty but retains sufficient functional and biological reserve and estimated life expectancy, and is therefore considered a candidate for individualised treatment. With geriatric intervention (prehabilitation), the patient may subsequently become eligible for standard treatment.
- Type 3 (Frail): Patient presenting irreversible deficits. Candidate for less aggressive treatment, in addition to geriatric follow-up for associated conditions, with risks and benefits of each intervention carefully balanced.
- Type 4 (Dependent or poor non-oncological prognosis): Patient with established dependency and/or significant comorbidities that limit life expectancy. Palliative treatment is recommended, prioritising symptomatic control.

This classification was not used solely for descriptive purposes and was established before the final treatment decision. Each category was linked to a predefined geriatric therapeutic recommendation (standard treatment, prehabilitation before standard treatment, treatment adaptation, or palliative management), which was presented by the geriatrician and considered during multidisciplinary tumour board discussions together with tumour stage, resectability and patient preferences. Importantly, the geriatric classification was established before the multidisciplinary tumour board discussion and was based exclusively on the multidimensional CGA findings and the geriatrician's overall clinical assessment, without considering the final treatment decision.

Multidisciplinary decision-making

All patients entered the study with an initial surgical treatment plan. Following complete oncological staging, patients with metastatic disease or tumours amenable to endoscopic resection were no longer considered candidates for curative surgery. The remaining patients underwent CGA before discussion at the weekly multidisciplinary tumour board. The committee comprised oncologists (medical and radiation), surgeons, pathologists, gastroenterologists, nuclear medicine specialists, radiologists and geriatricians. The geriatrician presented the CGA findings together with the corresponding geriatric classification and its therapeutic recommendation, which were considered alongside tumour stage, resectability and patient preferences during multidisciplinary discussion

Outcomes

The primary outcome was the association between CGA-based geriatric classification and the final multidisciplinary treatment recommendation (surgery, treatment refusal, or palliative management). A secondary analysis evaluated non-surgical management (treatment refusal or palliative management).

Statistical analysis

Statistical analyses were conducted using SPSS version 17 statistical software package. Differences were considered statistically significant at a p-value < 0.05. Continuous quantitative variables were described as mean ± standard deviation, and qualitative variables as absolute and relative frequencies (percentages). Comparisons between continuous quantitative variables were analysed using parametric tests (Student's t-test or ANOVA). When normal distribution could not be verified, non-parametric tests (Kruskal–Wallis or Mann–Whitney U) were used instead. Associations between qualitative variables were analysed using the chi-square test or Fisher's exact test (when N < 20 or expected cell count < 5). All variables were evaluated using the chi-square test for linear trend to determine whether their distribution showed a progressive increase across increasing levels of frailty.

To evaluate the association between geriatric classification and surgical decision, a binary logistic regression analysis was performed. The dependent variable was surgical decision (surgery vs. no surgery), while independent variables included geriatric classification, patient age, sex, and severe comorbidity. As a secondary analysis, frailty was dichotomised into fit/pre-frail (Types 1–2) and frail/poor prognosis (Type 3–4) groups. A multivariable logistic regression model was applied to examine the association between frailty and non-surgical management (treatment refusal or palliative approach), adjusting for age, sex, and comorbidity. Odds ratios (OR) and 95% confidence intervals (95% CI) were reported to estimate the magnitude of the effect of predictive variables on surgical decision-making.

This study was approved by the local Clinical Research Ethics Committee in accordance with the Declaration of Helsinki. All patients or their legal representatives provided informed consent to participate

The present study is part of the doctoral research of the first autor. A detailed description of the program and preliminary results from the first 74 patients in this cohort has been published previously[17]. The current study substantially expands the cohort and focuses specifically on quantifying the association between CGA-based geriatric classification and final multidisciplinary treatment recommendations, including multivariable analysis adjusted for age, sex and comorbidity.

Results

A total of 184 patients aged ≥80 years with CRC who were initially considered candidates for curative surgery were included. The mean age was 84.1 years (SD 4.3), and 24 patients (13.0%) were nonagenarians. A total of 106 patients (57.6%) were male.

Following CGA, patients were classified into four CGA-based geriatric groups: 83 (45.1%) as Type 1 (fit), 54 (29.5%) as Type 2 (pre-frail), 36 (19.6%) as Type 3 (frail) and 11 (6.0%) as Type 4 (poor prognosis). Baseline characteristics are summarised in Table 1. Increasing frailty was associated with older age,

higher comorbidity burden, worse functional and cognitive status, and poorer nutritional status (all $p<0.001$).

Table 1. Baseline characteristics according to CGA-based geriatric classification. Data presented as mean (SD) or *n* (%).

	Type 1 N=83 (45.1%)	Type 2 N=54 (29.5%)	Type 3 N=36 (19.6%)	Type 4 N=11 (6.0%)	p	p for trend
Mean age (SD)	82,7 (3.6)	85.2 (4.4)	85.6(5.0)	85.0(3.3)	**0.000**	
Sex male, n (%)	58 (69.9)	21 (38.9)	18 (50.0)	9 (81.8)	**0.001**	0.225
Severe comorbidity						
CIRS-G³6, n (%)	16 (19.3)	11 (20.4)	13 (36.1)	9 (81.8)	**0.001**	**0.005**
Anaesthetic risk ASA³3, n (%)	54 (76.1)	44 (88.0)	21(95.5)	3 (100)	0.090	-
³5 medications, n (%)	49 (59.0)	40 (76.9)	31 (86.1)	10 (90.9)	**0.005**	**0.001**
Functional status, mean (DS)						
FAC	4.9 (0.1)	4.7 (0.4)	4.2 (0.9)	2.2 (1.6)	**0.000**	**0.000**
Barthel Index	97.9(3.4)	93.9(5.8)	86.4(15.2)	39.5(21.0)	**0.000**	**0.000**
Lawton-Brody Scale						
Men	4.5 (0.7)	3.8 (1.2)	2.5 (1.5)	1.1 (1.4)	**0.000**	**0.000**
Women	7.6 (0.1)	6.3 (1.6)	3.9 (2.2)	0.5 (0.7)	**0.000**	**0.000**
Cognitive status, n (%)						
GDS ³3	4 (4.8)	6 (11.3)	17 (47.2)	6 (54.5)	**0.000**	**0.000**
Pfeiffer ³ 3	6 (7.3)	14 (26.4)	25 (69.4)	7 (63.6)	**0.000**	**0.000**
Nutritional status, n (%)						
BMI£22 Kg/m2	10 (12.2)	7 (13)	9 (25.7)	3 (30)	0.160	-
MNA-sf £ 11	49 (59)	43 (76.9)	31 (86.1)	11 (100)	**0.001**	**0.000**
Frailty status, n (%)						
SPPB£9	11 (13.3)	44 (86.6)	33 (91.7)	11 (100)	**0.000**	**0.000**
Gait speed £0.8m/s	8 (9.6)	45 (86.5)	33 (91.7)	11 (100)	**0.000**	**0.000**
Low handgrip strength	16 (19.3)	24 (45.3)	23 (63.9)	11 (100)	**0.000**	**0.000**
Frail Scale ³3	2 (2.5)	10 (18.5)	16 (45.7)	7 (63.6)	**0.000**	**0.000**
Frail-VIG Index ³0.2	11 (13.6)	24 (45.3)	28 (77.8)	11 (100)	**0.000**	**0.000**
CFS ³5	1 (1.2)	28 (77.8)	26 (72.2)	11 (100)	**0.000**	**0.000**

Social circumstances, n (%)						
Living at home	81 (97.6)	51 (94.4)	34 (94.4)	10 (90.9)	0.646	-

CIRS-G: Cumulative Illness Rating Scale-Geriatric. ASA: American Society of Anesthesiologist. GDS: Global Deterioration Scale of Reisberg. BMI: Body Mass Index. MNA-sf: Mini Nutritional Assessment Short Form. SPPB: Short Physical Performance Battery. CFS: Clinical Frailty Scale.

Following completion of oncological staging and CGA, 16 patients (8.7%) were no longer considered candidates for oncological curative surgery because of metastatic disease (n=9) or eligibility for endoscopic resection (n=7). The remaining 168 patients were discussed in a multidisciplinary tumour board (Figure 1).

Among the 168 patients who remained eligible for curative treatment after staging investigations, final treatment decisions differed significantly across CGA-based geriatric groups (p<0.001). The proportion of patients undergoing surgery decreased from 93.2% in Type 1 patients to 18.2% in Type 4 patients, whereas palliative treatment increased from 0% to 81.8% (Figure 2).

In multivariable logistic regression analysis, CGA-based geriatric classification was independently associated with surgical decision-making after adjustment for age, sex and severe comorbidity (p<0.001). Compared with patients classified as Type 4 (dependent/poor prognosis), those classified as Type 1 and Type 2 had markedly higher odds of undergoing surgery (OR 46.8, 95% CI 7.5–291.5 and OR 50.7, 95% CI 7.4–345.4, respectively), while Type 3 patients also showed increased odds (OR 6.8, 95% CI 1.2–39.4). Increasing age was independently associated with a lower likelihood of surgery (OR 0.8 per year, 95% CI 0.7–0.9; p=0.002), whereas comorbidity and sex were not significantly associated (OR 2.1, 95% CI 0.7–6.1 and OR 1.1, 95% CI 0.4–3.3, respectively). (Figure 3).

To enhance clinical interpretability, a secondary analysis was performed using non-surgical management as the outcome (Table 2). In this model, frailty was dichotomised into fit/pre-frail (Type 1–2) and frail/dependent (Type 3–4). Frail patients had significantly higher odds of non-surgical management compared with fit/pre-frail patients (OR 11.0, 95% CI 4.36–27.81; p<0.001). Increasing age remained independently associated with non-surgical treatment (OR 1.19 per year, 95% CI 1.06–1.33; p=0.002), while comorbidity and sex were not significantly associated.

Table 2. Multivariable logistic regression analysis of independent predictors of non-surgical management (treatment refusal or palliative treatment)

	OR	CI 95%	p
Type 3–4 vs Type 1–2	11.01	4.36 – 27.81	<0.001
Age (per year)	1.19	1.06 – 1.33	0.002
Sex (male vs female)	1.07	0.39 – 2.91	0.900
Comorbidity (CIRS-G ≥6)	2.11	0.76 – 5.88	0.154

CIRS-G: Cumulative Illness Rating Scale-Geriatric.

Discussion

In this prospective cohort of octogenarians with CRC initially considered for curative surgery, CGA-based geriatric classification was strongly associated with final multidisciplinary treatment approaches. Patients classified as fit or pre-frail almost invariably underwent surgery, whereas non-surgical management became increasingly frequent with worsening CGA-based geriatric status. Importantly, these associations remained independent of chronological age and comorbidity, suggesting that multidimensional geriatric assessment provides clinically relevant information beyond traditional surgical risk factors.

Although current international guidelines recommend performing a CGA to individualise cancer treatment in older adults[7, 8], most of the available evidence focuses on its prognostic value rather than on its impact on clinical decision-making in real-world practice [18]. Furthermore, in many clinical studies, assessment is often limited to frailty screening tools [19–30], whereas multidimensional evaluation through a full CGA is less commonly performed [31–33]. Moreover, the variability among different frailty assessment instruments further underscores the need to adopt a CGA-based approach rather than relying solely on screening tools [18].

Unlike the preliminary analysis of the first 74 patients, the present study specifically evaluates the association between CGA-based geriatric classification and final treatment recommendations after adjustment for chronological age, sex and comorbidity.

Evidence remains limited, but the involvement of geriatric teams in multidisciplinary tumour boards has been shown to substantially influence therapeutic decision-making based on patients' ability to tolerate treatment according to their baseline status [34]. In addition, a systematic review by Hamaker et al [35] showed that the oncological treatment plan was modified in a median of 28% of patients (range: 8–54%), mainly towards less intensive treatment, following CGA.

Recently, a retrospective cohort of patients over 65 years of age with gastrointestinal malignancies also demonstrated that CGA-derived recommendations influenced treatment planning[36]. Our findings complement these observations by showing that, in a homogeneous cohort of octogenarians with CRC

initially considered candidates for curative surgery, a CGA-based geriatric classification was independently associated with the final multidisciplinary treatment recommendation.

The findings of this study suggest that CGA provides value beyond risk stratification. Systematically integrating geriatricians into multidisciplinary tumour boards may transform CGA into a practical decision-support tool that translates multidimensional geriatric assessment into individualized therapeutic recommendations.

The most clinically relevant finding concerns frail patients (classified as Type 3). This group probably represents the population in whom CGA provides the greatest added value for multidisciplinary decision-making. Unlike fit patients, for whom surgery was almost universally recommended, or dependent patients, who generally received palliative care, this intermediate group showed variability in treatment decisions. This suggests that CGA may be particularly valuable in situations of clinical uncertainty, where therapeutic decisions require balancing surgical benefit with frailty, functional condition and patient priorities.

Another noteworthy finding was the relatively high proportion of treatment refusal, particularly among frail patients. After being informed by the surgeon about the diagnosis, prognosis, and therapeutic alternatives, and by the geriatrician about their CGA-based classification, they decided whether they wished to undergo surgery. Following this process, patients declined treatment in 11% of cases, most commonly among frail patients (26%). One possible explanation is that systematic geriatric assessment improved patients' understanding of their overall health status and prognosis, thereby facilitating shared decision-making aligned with individual preferences.

Previous studies have reported substantially lower treatment refusal rates (approximately 2.5%), with patients aged over 80 years accounting for more than 90% of refusals [37]. In a recently published systematic review, refusal rates for surgery were similar, at 0.25–3.26% [38]. These data contrast with those observed in our study (11% refusal). This may be because our patients were older on average (84.5 years), and age is a risk factor for refusing surgical treatment [37]. Among octogenarians, 8% declined oncological treatment, compared with 27% of nonagenarians.

The main strength of this study is the systematic integration of multidimensional CGA into routine multidisciplinary decision-making. Another strength is that all CGAs were performed by the same experienced geriatrician, minimising interobserver variability in geriatric classification. Additional strengths include the prospective design, inclusion of consecutive patients, the very advanced age of the cohort, and the real-world clinical setting. Our findings also have implications for the implementation of care for older cancer patients. A recent study demonstrated that the systematic integration of comprehensive geriatric assessment (CGA) into multidisciplinary tumor boards is feasible and well accepted by clinicians[39]. Our results complement these implementation data by showing that, once integrated into routine clinical practice, a structured CGA- based classification is strongly associated with final multidisciplinary treatment recommendations.

Limitations include the single-centre design and possible selection bias, as patients in poorer condition may have been excluded from surgery directly at the General Surgery clinic without geriatric assessment. The wide confidence intervals observed in some regression estimates probably reflect the limited number of patients classified as Type 4. Similar CGA-based approaches with four-group classification have been used in other real-world cohorts, supporting the feasibility of this strategy in routine clinical practice, although external validation remains limited [40].

In conclusion, in octogenarians with CRC initially considered for curative surgery, CGA-based geriatric classification was strongly associated with final multidisciplinary treatment recommendations. These findings support routine integration of geriatric assessment into colorectal tumour boards, enabling treatment decisions to be guided by biological rather than chronological age.

Declarations

Conflict of interest:

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Institutional review board statement

This study was approved by the local Clinical Research Ethics Committee in accordance with the Declaration of Helsinki

Informed consent:

Informed consent was obtained from all participants involved in the study.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this manuscript, the authors used Open AI to assist with language editing and improve the clarity and organisation of the manuscript. The AI tool was not used for data analysis, interpretation of results or generation of scientific conclusions. The authors critically reviewed and edited all outputs and take full responsibility for the content of the publication.

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Figures

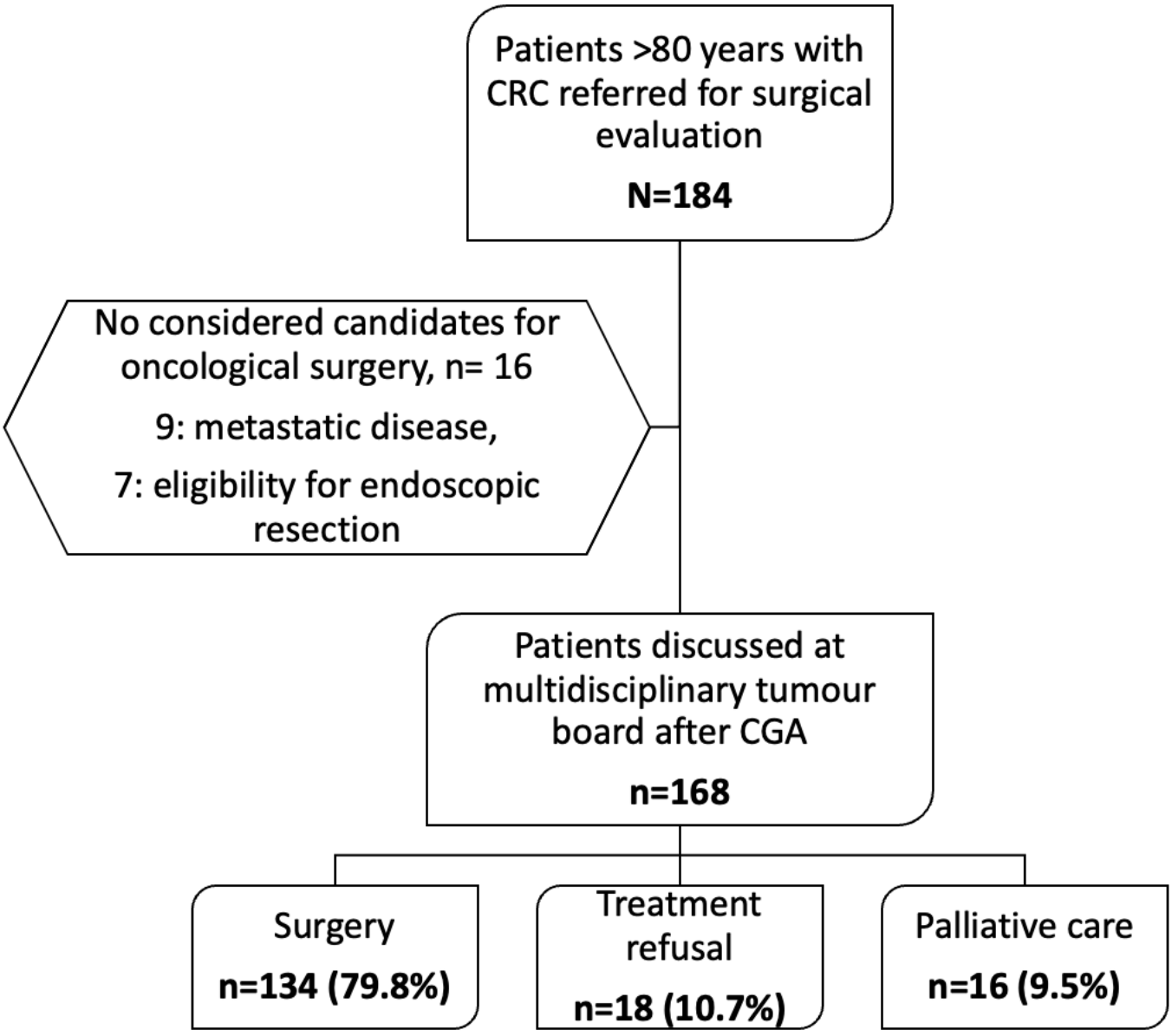


Figure 1

Flowchart of the study of patients over 80 years of age proposed for surgery for colorectal cancer

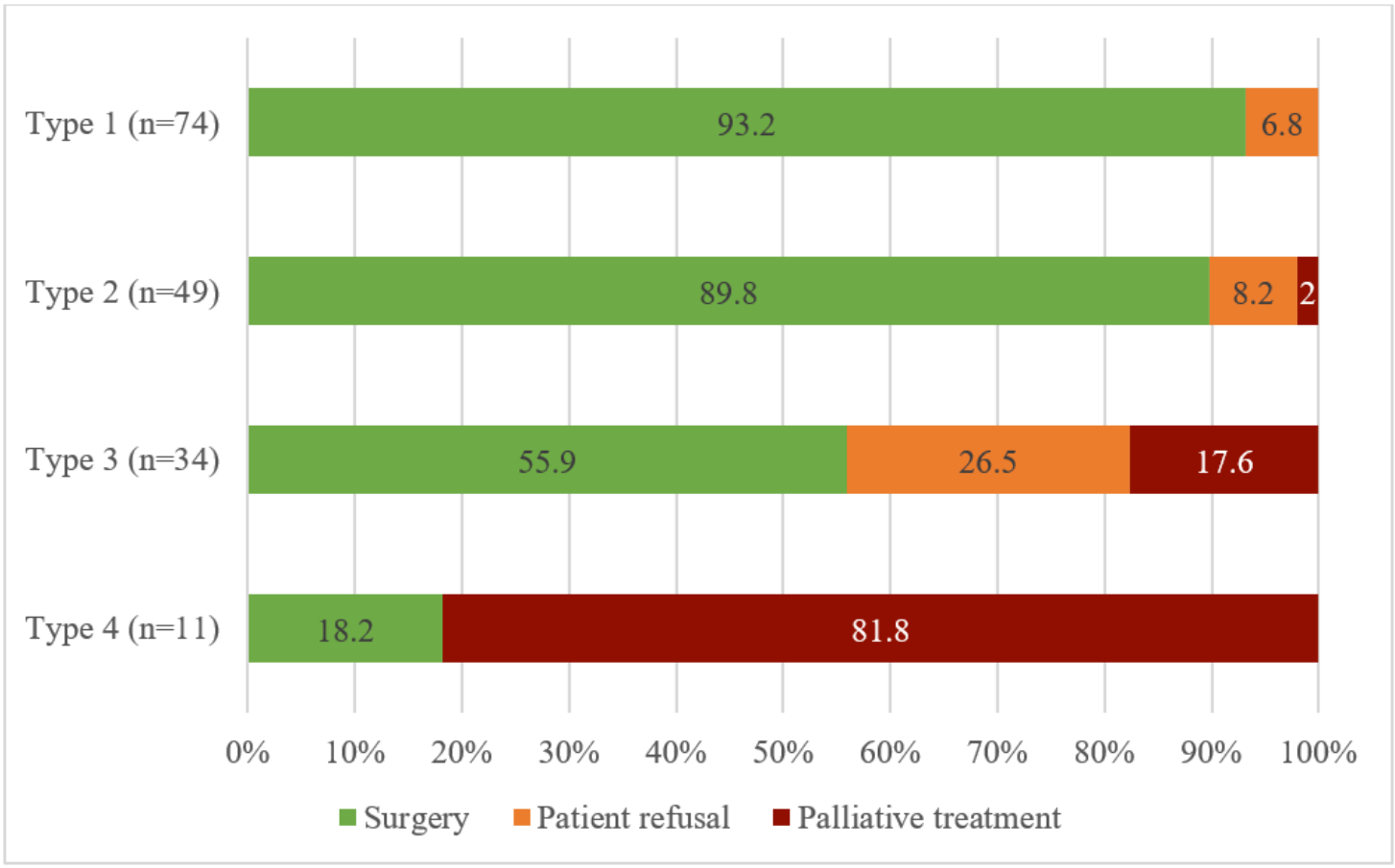


Figure 2

Final multidisciplinary treatment recommendations according to CGA-based geriatric classification. Values represent the percentage of patients within each geriatric group undergoing surgery, declining treatment, or receiving palliative management

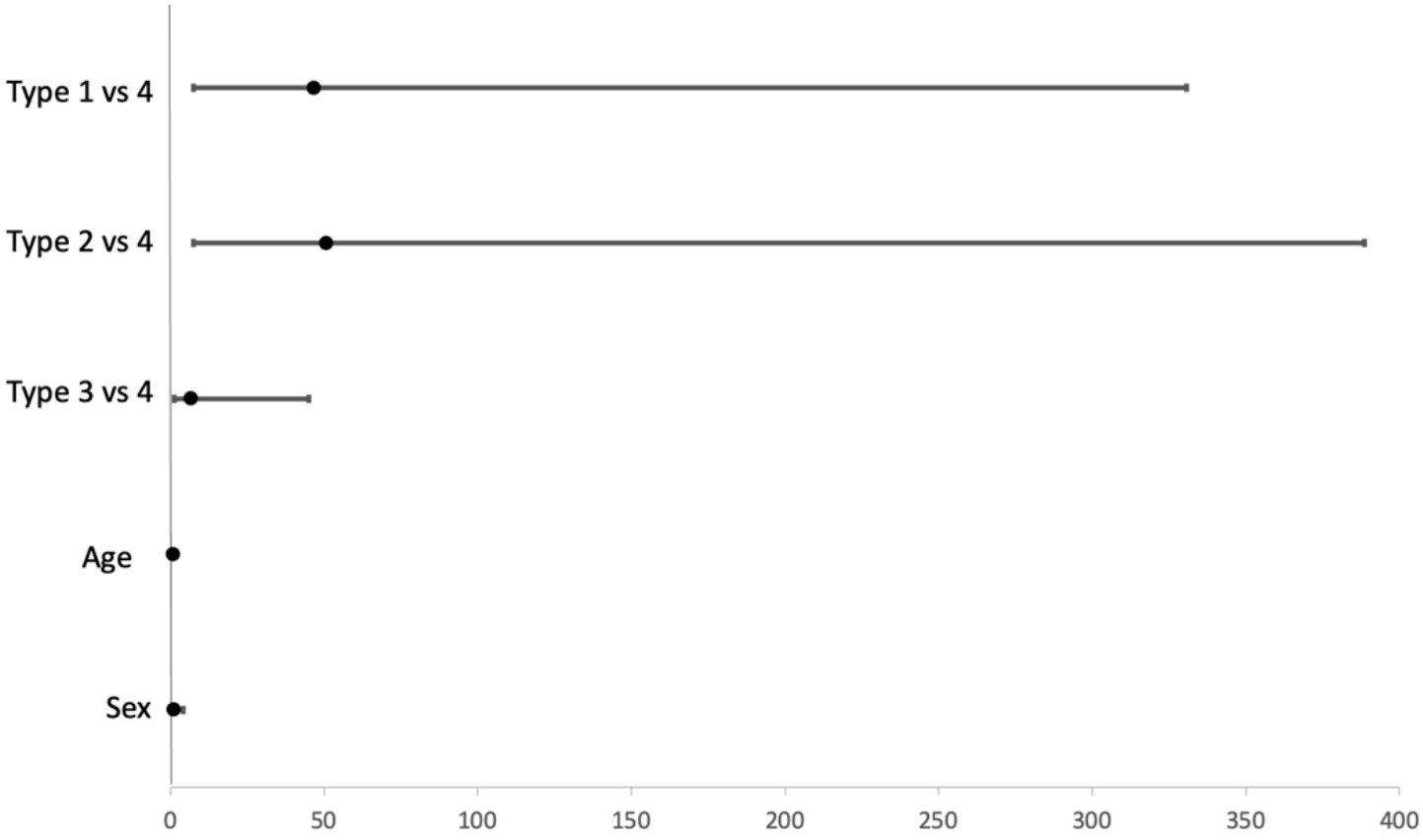


Figure 3

Forest plot of multivariable logistic regression analysis for predictors of surgical treatment in patients with colorectal cancer

Supplementary Files

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- GraphicAbstract.png