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Malignant bowel obstruction in patients affected by advanced cancer: clinical and radiologic findings to support decision-making process in the emergency department

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Abstract

Malignant Bowel Obstruction (MBO) is an often preterminal complication of gastrointestinal and gynecological cancers. We tried to identify clinical and radiological parameters suggesting early providing of End of Life (EOL) care protocols in this kind of patients at Emergency Department (ED) presentation. We retrospectively analyzed 60 ED patients admitted for MBO in a one-year period, identifying a Bad Prognosis Group (BPG) (died or transferred to EOL care centers) and a Good Prognosis Group (GPG) (prosecution of treatment with curative intent). Potential predictors of bad prognosis were: time of onset of symptoms, Eastern Cooperative Oncology Group performance status (ECOG), Charlson Comorbidity Index (CCI), past intestinal obstruction, previous abdominal surgery and therapeutic strategy adopted. Computed tomography scan studies were reviewed by expert radiologists. CCI $\geq$ 4 (p=0,030), ECOG score $\geq$2 (p=0,016), no large bowel occlusion (p=0,045), mesenteric infiltration retraction (p=0,047) and extraperitoneal metastases (p=0,049) confirmed independent predictive value of bad prognosis at multivariate analysis. Identifying clinical and radiological criteria at ED evaluation can be useful to better identification of those MBO patients who may benefit from early providing EOL care protocols.

Key words: malignant bowel obstruction, End of Life care, gastrointestinal cancer, gynecological cancer, Emergency Department.

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Introduction

The life expectancy of cancer patients increases constantly according to advances in medical research, treatment and technology.[1,2] Thus, the number of people surviving from cancer or living with end-stage diseases continues to grow.[1] The Emergency Departments (ED) are involved in the evaluation and treatment of an increasing number of cancer patients with acute crises of their chronic condition,[3,4] which are often sign of disease progression to an End-Of-Life-situation (EOL).[5] This definition is not limited to describe the condition of cancer patients for whom decease is imminent, but also that of those patients facing the 12 months leading up to their death.[6,7] Many reports have been published stressing how the ED setting is inadequate in providing EOL care, cause limited education opportunities for nursing and medical staff, lack of standardized protocols supporting effective decision making processes, problems in time, space and workload, and logistical resource allocation.[8,9] Malignant Bowel Obstruction (MBO) is a frequent and often preterminal complication of gastrointestinal and gynecological cancers that can be considered paradigmatic of the situation illustrated above. It affects 10% to 30% of patients with gastrointestinal malignancies and up to 60% of patients with gynecological cancers.[10-12] Survival -from MBO reaches a maximum of 10 months in surgically fit patients that can be submitted to invasive treatment.[13,14] Thus, for the vast majority of these patients, EOL care protocols has to be considered as soon as possible among their treatment options.[15] Although implementing interventions to improve EOL care in the ED are emerging,[3,4,16] introducing this kind of approach in the ED setting is still a challenging problem worldwide.[10,17] The aim of this study is to evaluate, in a retrospective series of patients admitted to the ED for MBO, which clinical and radiological factors at presentation can predict a bad prognosis in terms of no chances of pursuing oncologic treatment with curative intent and, consequently, suggest the opportunity to start EOL care protocols as soon as possible in the emergency setting.

Materials and Methods

We retrospectively analyzed a series of 60 consecutive patients affected by abdominal or gynecological cancer, admitted to the ED of a tertiary university hospital from 01st January 2022 to 31st

December 2022, complaining of symptoms suggesting of MBO, confirmed by Multidetector Computed Tomography scan with intravenous contrast (MDCT) of the abdomen. Criteria of exclusion were: age<18 years, diagnosis of primary abdominal or gynecological cancer made in the ED, evidence of adhesive postoperative or radiation induced Small Bowel Obstruction (SBO), complicated Inflammatory Bowel Disease (IBD), refused admission to acute care ward or transfer to other oncologic centers after diagnosis of MBO, MDCT images not available for revaluation and discharge at home after early resolution of obstruction after medical treatment (Figure 1). For all patients included, we extracted the following data by reviewing the clinical records: Demographics,

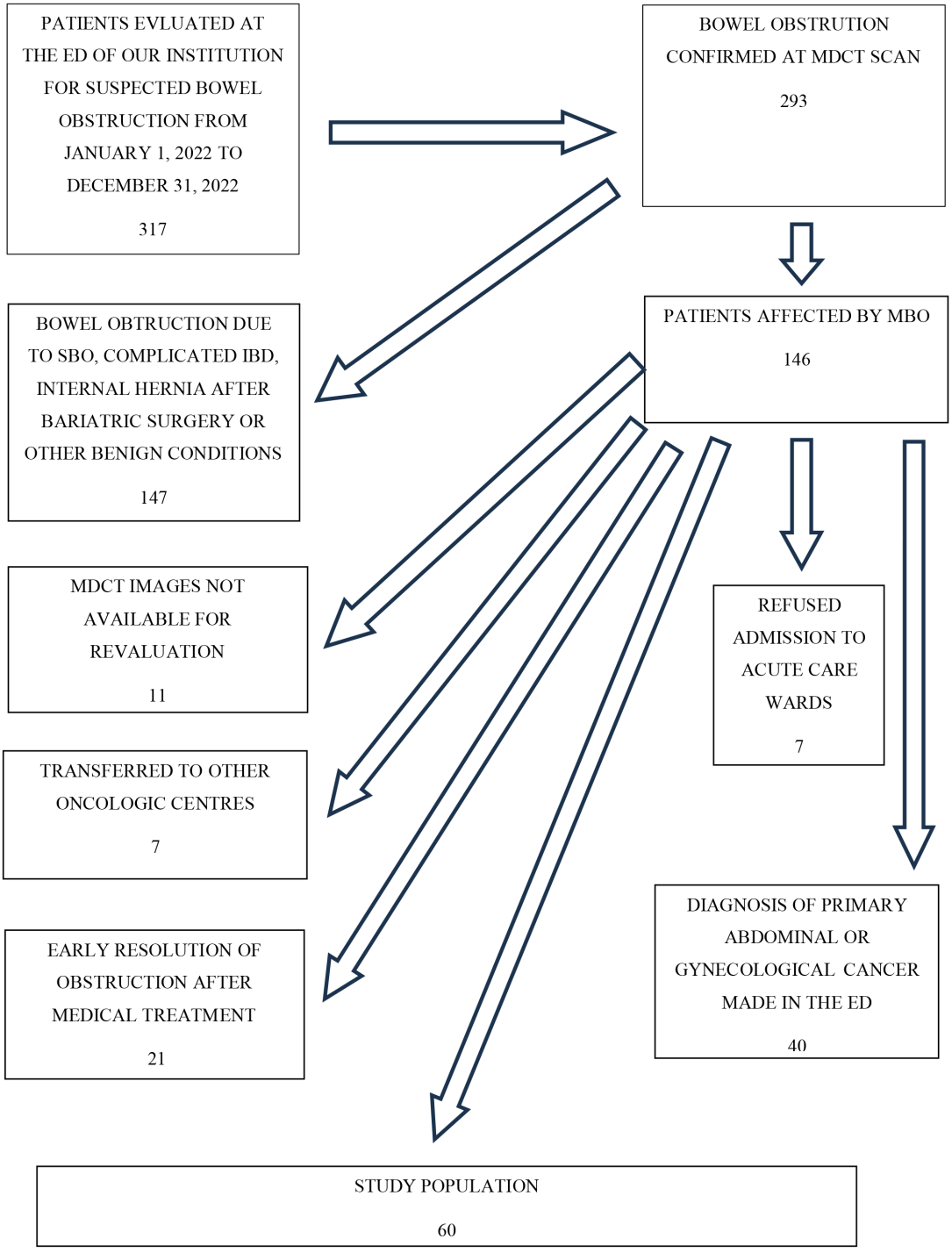

Figure 1. Identification of the study population.

triage code attributed, type of malignancy, time of onset of symptoms, Eastern Cooperative Oncology Group performance status (ECOG PS),[18] Charlson Comorbidity Index (CCI),[19] history of past episodes of intestinal obstruction, history of previous abdominal surgery, therapeutic strategy adopted in the ED and length of stay in the ED before admission to acute care wards. All MDCT studies were performed on multidetector helical scanner (GE Medical Systems, Milwaukee, WI) with 64 detector rows. Images were obtained during patient breath-holding using the following acquisition parameters: 120 kVp; auto mA (depending on patient size), range 240-400 mA; mean section thickness and reconstruction interval of 2.5 mm; pitch <1. All patients received nonionic intravenous contrast material. Time delay from contrast injection to scanning was approximately 80 seconds. A panel of expert radiologists with consolidated experience in abdominal, emergency and gynecologic cancer imaging, re-evaluated all MDCT studies blinded to patients' clinical data. This revaluation was focused on highlighting the presence of possible intestinal obstruction sites, in both the small and large bowel, transition points (single or multiple) and thickening or thinning of dilated bowel wall (diameter greater than or less than 5 mm), with or without bowel wall enhancement in the dilated loops. The peritoneal deposits, if present, were evidenced as well-defined soft-tissue nodules/caking in the peritoneal or serosal surfaces, omentum, upper quadrants ligaments, mesocolon and mesentery (the details on their location were also reported). Tumor deposits along the mesentery were evidenced as focal soft tissue masses, more frequently located in the broad mesentery fan and often unresectable from small bowel loops. Mesenteric infiltration, if present, was defined as diffuse thickening or tethering along the mesentery. The presence of ascites was also reported (Table 1). All of the patients considered in this series were transferred to surgical or gynecologic oncology wards after initial treatment in the ED for prosecution of treatment. Follow up data were reviewed in terms of starting of EOL care protocols in hospice setting after initial transfer to acute care departments, prosecution of oncologic treatments with curative intent after discharge or death at 30 days from diagnosis of MBO.

Statistical analysis

Descriptive statistics were used to summarize the data. Continuous variables were reported as means with standard deviations (M ± SD), while categorical variables were presented as absolute counts and percentages. Normality of distribution for continuous variables was assessed using the Shapiro–Wilk test, and comparisons between groups were performed using the Student's t-test. Categorical variables were compared using the Chi-square test or Fisher's exact test, the latter being applied when the absolute sample size in at least one group was smaller than six. A multivariable logistic regression analysis was conducted, including all variables with a p-value ≤ 0.10 in univariate analysis. The model was adjusted for the following predefined confounding factors: sex, age, CCI, and ED triage priority code. A two-sided p-value < 0.05 was considered statistically significant.

Results

A total of 60 patients were included in the study. There were 39 females (65%) and 21 males (35%), with a median age of 62,8 years (σ 12.9). The primary site of the tumor was abdominal in 30 cases (50%) and pelvic in the other 30 (50%). The ED triage priority code assigned was 1 in 2 cases (3.3%), 2 in 11 cases (18.3%), 3 in 43 cases (71.7%) and 4 in 4 cases (6.7%). Thirty-six patients had history of prior abdominal surgery (60%) and 7 ones referred prior episodes of intestinal obstruction (11.7%). Onset of symptoms more than 48 hours before access to the ED was referred by 34 patients (56.7%). CCI was assessed as ≥ 4 in 43 cases (71%) and ECOG score was assigned as ≥ 2 in 23 cases (38.3%). The length of stay in the ED before transfer to surgical or gynecologic oncology wards varied from 7 hours to 126 hours (median 40 hours). Medical treatment, including gastroenteric drainage, antiemetics, analgesics, and antisecretory drugs was performed in the ED and prosecuted after the admission to the acute care wards in 35 cases (58.3%), while surgical intervention was performed in

Table 1. MDCT findings after revaluation by the expert panel.

MDCT findings	N° of cases	%
Obstrutcive neoplastic mass large bowel	16	37
Single transition point	34	58.6
Multiple transition point	24	41.4
Dilated bowel wall thinning (<5 Mm)	36	62.1
Dilated bowel wall thickening (>5 Mm)	7	12.1
Dilated bowel wall enhancement	40	66.5
Ascites	35	58.3
Ascites distribution central	16	45.6
Ascites distribution periferic	19	54.4
Peritoneal tumor deposit	43	32.2
Single peritoneal tumor deposit infiltrating the bowel wall	9	21
Multiple peritoneal tumor deposit infiltrating the bowel wall	26	79
Mesenteric infiltration	32	53.3
Mesenteric infiltration nodular pattern	8	25
Mesenteric infiltration infiltrative pattern	24	75
Mesenteric infiltration retraction	18	31.6
Extraperitoneal metastasis	25	41.7

the remaining 25 cases (41.7%), namely, bowel resection in 5 cases (20%), ileostomy/jejunostomy in 11 cases (44%) and colostomy in 7 cases (28%). Twelve patients (15%) died within 30 days after diagnosis of MBO, 6 within a few days after the admission to the acute care wards and the other 6 after transfer to EOL care centers (in 2 cases death occurred during readmission to the acute care ward for relapsing MBO at 20 days after initial transfer to EOL care center). Twenty-four patients (44.4%) were transferred to EOL care centers and 30 (50%) were discharged at home and pursued oncologic treatment and follow up with curative intent. For statistical purpose, the study population was divided into 2 groups, the bad prognosis group, including those who died after the admission to acute care wards or were transferred to EOL care centers (BPG), and the good prognosis group, counting of those who pursued oncologic treatment with curative intent (GPG). Clinical parameters resulted statistically significant in predicting bad prognosis at univariate analysis were: CCI ≥ 4 (90% in BPG *vs* 53.33 % in GPG – p 0.0034), ECOG PS ≥ 2 (56.67% in BPG *vs* 24 % in GPG – p 0.0035) and invasive procedures performed (30% in BPG *vs* 53.3 % in GPG – p 0.07). Among MDCT findings evidenced by the expert panel after reevaluation of images, evidence of large bowel occlusion (20% in BPG *vs* 40% in GPG – p 0.04), ascites (76.67% in BPG *vs* 40% in GPG – p 0.004), peritoneal tumor deposit infiltrating the bowel wall (76.7% in BPG *vs* 30% in GPG – p 0.013), single peritoneal tumor deposit infiltrating the bowel wall (17.1% in BPG *vs* 8% in GPG – p 0.004), mesenteric infiltration (70% in BPG *vs* 36.67 % in GPG – p 0.01), mesenteric infiltration retraction (43.7% in BPG *vs* 12,5% in GPG – p 0.045) and extraperitoneal metastasis (53.3% in BPG *vs* 30% in GPG – p 0.07) resulted statistically significant in predicting bad prognosis at univariate analysis (see Table 2 for detailed results). All clinical parameters and radiologic findings predictive of bad prognosis at univariate analysis were included in a multivariate analysis to confirm statistically independent predictive value, and so was for CCI ≥ 4, (p=0.030; OR =4.968, 95% CI: 2.213 – 8.667), ECOG score ≥ 2, (p=0.016; OR=6.216; 95% CI: 2.405–15.955), absence of large bowel occlusion (p=0.045; OR=0.210 95% CI: 0.101 – 0.911), mesenteric infiltration retraction (p=0.047; OR=2.398; 95% CI: 0.161 –9.480) and evidence of extraperitoneal metastases (p=0.049; OR=3.639; 95% CI: 0.132 – 6.232), (see Table 3 for detailed results).

Discussion

Malignant bowel obstruction is one of the most challenging condition shared by clinicians and patients in the setting of complicated abdominal and gynecological cancers.[20,21] A large amount of literature has been published in the last years focused on precising the best pathways of treatment. Two type of consideration emerge, one the result of the other: MBO is a clinical condition characterized by poor prognosis also if treated by surgery or otherwise invasive procedures; it occurs in the context of shortened life expectancy, as being sign of advanced malignancy in patients often affected by multiple comorbidities.[11-14] Thus, when MBO occurs, the main goal of treatment often shifts from curative intent to ensuring the best quality of life as possible in a context of EOL care.[12,13] The ED physician is more and more frequently engaged in the evaluation

Table 2. Results of univariate analysis of clinical and radiologic parameters predicting bad prognosis in cases of MBO.

	BPG		GPG		p
	N	%	N	%	
Median age	63.2	13.55	62.33	12.4	0.80
Female gender	22	73.33	17	56.67	0.17
Onset of symptoms > 48 h	14	46.67	20	66.67	0.12
Previous abdominal surgery	19	63.33	17	56.67	0.6
Past episodes of intestinal obstruction	4	13.33	3	10	1
ECOG ≥2	17	56.67	6	24	0.0035
CCI≥4	27	90	16	53.33	0.0034
Invasive procedures	9	30	16	53.33	0.07
Large bowel occlusion	6	20	12	40	0.04
Transition point single	14	46.67	10	33.33	0.2
Transition point multiple	16	53.33	10	33.33	0.2
Dilated bowel wall thickening	4	14.29	3	10	0.7
Dilated bowel wall enhancement	20	71.43	21	70	0.9
Ascites	23	76.67	12	40	0.004
Ascites distribution central	12	52.17	8	27.59	0.45
Ascites distribution periferic	11	47.83	8	27.59	0.45
Peritoneal tumour deposit	23	76.67	20	66.67	0.39
Peritoneal tumour deposit infiltrating the bowel wall	23	76.67	12	30	0.0013
Peritoneal tumour deposit infiltrating the bowel wall single	6	1.1	3	8.5	0.0004
Mesenteric infiltration	21	70	11	36.67	0.01
Mesenteric infiltration retraction	14	43.7	4	12.5	0.045
Extraperitoneal metastasis	16	53.33	9	30	0.07

and treatment of oncologic patients suffering from sign and symptoms that are expression of an EOL condition[8-10] and MBO can be considered highly representative of this situation. Our study is based on the retrospective evaluation of 60 consecutive patients affected by MBO observed over the course of 1 year. To the best of our knowledge, this is one of the largest series of consecutive patients affected by this condition reported in literature as a result of a consolidated experience in the management of cancer patients in our tertiary university hospital, with special reference to abdominal and gynecological malignancies. The ominous prognosis of MBO in terms of survival, is unanimously stressed in literature, and varies from a maximum of 5 weeks when surgery is not feasible, to 10 months in surgically fit patients.[11-13] This was confirmed also in our series where 15% of patients died within 30 days from diagnosis. Moreover, for half of the patients, the occurrence of MBO meant discontinuation of treatment protocols with curative intent and provision and delivery of EOL care. Simultaneous care in oncology, defined as a therapeutic approach which is based on the early integration of palliative care in the treatment protocols of cancer patients, is nowadays considered as an essential goal to enhance quality of life of patients suffering from end stage disease.[15,22] Many randomized controlled trials showed increased Quality-Of-Life (QOL) and satisfaction with care as well as decreased mean depression score at 3 months, in cancer patients who were provided with palliative care protocols early in the standard oncology care.[23,24] The success of such approach will be much more higher if it will be the result of an Advance Care Planning (ACP), as it is defined that essential process by which cancer patients are empowered to articulate their personal values, preferences and goals to make decisions for their future care, with particular reference to end-of-life options.[25] The ACP was developed as a result of the legal recognition of self-determination and the right of patients to accept or decline any kind of potentially curative or only of life-sustaining measures proposed by the medical team. In Italy, this inalienable right is sanctioned by Law 219/217.[26] Advanced care planning should be an interactive process made of repeated meetings with oncologists and palliative care specialists, appropriately scheduled form the early initial evaluation. Nevertheless, though widely recognized as an integral component of oncology care, ACP has not been systematically implemented into everyday practice[25] and, consequently, the ED physicians can easily face with the necessity of introducing routine EOL care protocols in the ED setting. This is a troublesome challenge. The specialists in Emergency Medicine, both physicians and nurses, do not receive adequate training focused on dealing with this particular type of care.[5] Cancer patients in EOL condition receive often low priority triage code when presenting at the ED, and this can lead to remarkable delay in timely assessment and taking charge of the patient.[27] Access block is a well-known problem of ED worldwide that interferes with transfer of patients to acute care wards in a reasonable timeframe.[28] Moreover, when admitted to the ED, cancer patients in EOL condition will be subject to further investigations and aggressive treatments which will probably have no impact on their prognosis and only after a long hospital stay they will be transferred to EOL care centers. Also in our experience, only 12% of MBO patients was admitted to the ED with high priority triage code (1 or 2), permanence in the ED before the admission to the acute care wards lasted from a minimum of 7 hours to a maximum of 126 hours, with a median of 40 hours, and length of hospital stay prior to EOL care centers transfer varied from 4 days to 33 days (median 13,7 days). All these considerations may explain how the inclusion of early EOL care protocols in the management strategy of cancer patients in the ED is not yet widely adopted. The development and validation of appropriate screening criteria for identification of cancer patients who may benefit from early provision and delivery of EOL care in the ED may contribute to overcame this challenge and allow virtuous integration of EOL care pathways and ED approach.[29,30] For this purpose we tried to identify a group of clinical and radiological findings at presentation to the ED, which could be associated to bad prognosis in terms of discontinuation of oncologic therapy with curative intent and starting of EOL care protocols, in patients affected by a typical EOL condition as MBO. Among clinical findings resulted statistically significant at univariate analysis, CCI ≥ 4, and ECOG score ≥ 2 were confirmed as independent indicators of bad prognosis at multivariate analysis. These data stress the negative impact on prognosis of comorbidities and bad performance status of oncologic patients already reported in literature. Among the radiologic findings resulted from the re-evaluation of MDCT images by the panel of expert radiologists, on the base of what already seen in a previous experience limited to an advanced ovarian cancer series,[21] evidence of large bowel occlusion, mesenteric infiltration retraction or extraperitoneal metastases, resulted as statistically significant variables of bad prognosis in both univariate

Table 3. Clinical and radiologic parameters which confirmed independent predictive value of bad prognosis at multivariate analysis.

	Sign.	Exp(B)	95% confidence interval for Exp(B) Inferior limit	Superior limit
Age	0.258	10.082	0.944	10.239
Gender (M 00. F1)	0.200	30.533	0.288	80.852
ECOG ≥ 2	**0.016**	**60.216**	**20.405**	**150.955**
CCI ≥ 4	**0.030**	**40.968**	**20.213**	**80.667**
Large bowel occlusion	**0.045**	**0.210**	**0.101**	**00.911**
Performed invasive procedures	0.345	20.557	0.114	50.743
Ascites	0.133	10.359	0.444	40.183
Peritoneal tumor deposit infiltrating the bowel wall	0.453	40.295	0.095	90.720
Peritoneal tumor deposit infiltrating the bowel wall single	0.156	0.094	0.004	20.461
Mesenteric infiltration	0.481	0.345	0.018	60.681
Mesenteric infiltration retraction	**0.047**	**20.398**	**10.061**	**90.480**
Presence of extraperitoneal metastasis	**0.049**	**30.639**	**10.032**	**60.232**

and multivariate analysis. Large bowel occlusion is normally due to a single transition point secondary to extrinsic mechanical compression by tumor deposits, a condition that can be more easily solved by surgery, and this may explain the protective value relative to bad prognosis seen in our series. Mesenteric infiltration retraction is a sign of bowel wall and/or mesenteric nervous plexuses infiltration by tumor deposits, a condition that strongly impairs normal peristaltic activity, leading to a picture of functional intestinal obstruction difficult to solve, with negative impact on prognosis. The same can be said by the evidence of extraperitoneal diffusion of the disease, radiological counterpart of an end of stage disease.

Study limitations

The limitations of our study are inherent to the single-center retrospective nature of the design and the limited number of patients. Confirmation of the results by multicenter prospective studies conducted with larger patient cohort are needed.

Conclusions

Malignant Bowel Obstruction is a frequent complication of gastrointestinal and gynecological cancers with ominous prognosis. Patients affected by this evolution of their oncologic disease are very often evaluated in the ED, as those affected by many other clinical situations that are signs of an EOL condition. For this kind of patients, early administration of EOL care protocols in the ED context is strongly advisable and feasible. Nevertheless, many challenges still remain to be overcome to spread the adoption of this kind of approach in the emergency setting. In particular, the development and validation of clinical criteria at ED evaluation is strongly advisable to allow better identification of cancer patients who may benefit from early providing EOL care protocols, in order to contribute to the wider diffusion of this virtuous integration of EOL care pathways in the ED setting.

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