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RESEARCH ARTICLE

Patterns and Determinants of Terminal Hospital Admissions in Advanced Cancer

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Abstract

Background: Avoidable end-of-life hospital admissions remain common in oncology and often signal suboptimal palliative support. We aimed to characterize the clinical features and disease factors associated with terminal admissions at a tertiary care hospital. **Methods:** We performed a retrospective cohort study of all adults with advanced solid or hematological malignancy who were managed by the palliative care service and died in hospital between 1 January 2022 and 31 March 2024. Demographics, primary cancer site and stage, admission diagnosis, and length of stay (LOS) were obtained from electronic records. Descriptive statistics summarized frequencies whereas χ^2 tests and adjusted residuals explored associations between malignancy type and admission reason. **Results:** 586 patients with cancer met inclusion criteria (52.2 % male; mean age 66.8 ± 15.8 years). Stage IV solid tumors predominated (79.5 %). The leading primary cancers were gastrointestinal (51.2 %), breast (10.1 %), and genitourinary (8.5 %). Principal causes of terminal admission were performance status deterioration (28.8 %), gastrointestinal (GI) symptoms (21.0 %: vomiting 36 %, malignant bowel obstruction 23 %), respiratory complications (16.6 %: pneumonia 86 %), altered consciousness (13.3 %), and other causes including pain and sepsis. GI symptoms as the cause of admission was strongly linked to GI cancers ($p < 0.001$), while respiratory symptoms were more common in lung cancers ($p = 0.005$). Mean LOS was 21.64 ± 15; 6.7% of patients died within 48 h and 21.3% remained hospitalized ≥30 days. **Conclusions:** Terminal admissions were driven largely by abrupt functional decline, uncontrolled GI disturbances, and pneumonia. Associations between the type of cancer and the cause of admission were prevalent. These findings offer data driven guidance for improving outpatient and home based palliative care in patients with advanced cancer.

Keywords: Palliative care- terminal cancer- end-of-life admission

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1. Introduction

End-of-life hospitalizations among patients with advanced cancer remain common worldwide, despite a general preference to die at home rather than in medical institutions [1]. Avoidable hospital admissions in the final stages of life are a well recognized challenge in cancer care. High rates of terminal hospital admissions and in hospital deaths have raised concerns about the quality of end-of-life care. In many high-income settings, more than half of cancer patients still spend their final days in acute-care hospitals [2]. This pattern persists even though aggressive interventions near death often do not align with patient wishes and can negatively impact quality of life [3]. For patients with advanced disease, being confined to a hospital bed in the last weeks of life

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without a clear medical need is both distressing and costly. Many admissions provide little clinical benefit, reflecting a possible failure of the health system to meet patients' needs in more appropriate settings [4]. The Lancet commission on the Value of Death has described a paradox of modern dying: in some regions patients are "overtreated in hospitals" while others lack access to basic end-of-life care [5].

Patients with advanced malignancies experience a heavy symptom burden as they approach the end of life. Studies report that in the final days virtually all patients experience profound fatigue, and majorities suffer symptoms such as pain, anorexia, and dyspnea [6]. Furthermore, families may feel overwhelmed not knowing how to manage their loved ones' symptoms [7]. These distressing symptoms frequently precipitate emergency department visits and unplanned hospital admissions. Additionally, terminal hospitalizations consume substantial resources; late-life hospital days account for a disproportionate share of health expenditures [4]. These patterns not only incur substantial economic costs but also risk undermining the quality of patients' final days. Studies estimate that perhaps 20–40% of admissions could be averted with better anticipatory care [4]. Such findings underscore that many final admissions may occur because community or home based care was unable to adequately manage escalating symptoms and functional decline.

Identifying the patterns and causes of these admissions is therefore crucial for improving palliative care delivery. By understanding the common symptoms and emergencies that lead to hospitalization, clinicians can develop targeted strategies to intervene earlier. Given these gaps, we conducted a retrospective cohort study of patients with advanced cancer, all under palliative care, who died during a tertiary hospital ad-mission in Saudi Arabia. We analyzed the symptoms, diagnoses, and factors associated with these hospitalizations. Ultimately, we aimed to understand why patients near death are hospitalized to inform strategies to optimize palliative referral, strengthen home or hospice care, guide patient–family discussions, minimize avoidable hospitalizations, and ensure that end-of-life care in Saudi Arabia is aligned with best practices and patient-centered outcomes.

2. Materials and Methods

1.2. Study Population

This was a retrospective cohort study conducted in a tertiary care hospital in Riyadh, Saudi Arabia. All patients aged over 16 years, with confirmed stage III/IV solid malignancy or hematological malignancy, who were admitted under the inpatient palliative care service and who subsequently expired in the hospital during the same terminal admission were included. We excluded patients with stage I/II solid malignancy. The study spanned 2 years and 3 months, from January 1, 2022, to March 31, 2024. This study was approved by the Institutional Review Board at King Abdullah International Medical Research Center (KAIMRC) and the ethics committee at the Ministry of National Guard-Health Affairs under the approval number IRB: NRR24-011-6. The requirement for written informed consent was waived by the KAIMRC ethics committee due to the retrospective nature of the study. All methods were conducted in accordance with relevant guidelines, including the "Declaration of Helsinki" and the "Saudi Arabian Law of Ethics on Living Creatures." Data was securely stored and was accessible only to the primary investigator and co-investigators. No identification of correspondents was included in the dataset.

2.2. Data Extraction

Cases were identified through the hospital's electronic medical records, and data extraction was performed by two independent reviewers using a standardized sheet. Main variables included age, sex, background clinical features (primary malignancy diagnosis and stage), admission diagnosis (obtained from admission notes), and length of stay. Decline in performance status was defined as an increase in Eastern Cooperative Oncology Group (ECOG) score by ≥1 level from baseline.

2.3. Statistical Analysis

Descriptive statistics were employed to summarize the data. Quantitative variables were presented as mean ± standard deviation (SD), while qualitative variables were expressed as frequencies and percentages. Associations between categorical variables were assessed using the Chi-Square Test or fisher's exact test if cell counts were less than 5. Adjusted residuals were analyzed to identify specific cells with significant deviations from expected counts, with values exceeding ±1.96 indicating statistical significance ($p < 0.05$). There were no missing values across the included variables and all cases were included in the analysis. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), version 30.0. Data handling followed STROBE guidelines [8].

3. Results

3.1. Demographics and Primary Cancer Diagnosis

The study included 586 patients, of whom 306 (52.2%) were male. The age of the patients ranged from 16 to 107 years, with a mean age of 66.82 ± 15.81 years (Table 1).

Of the 586 patients, 79.5% (n=466) were diagnosed with stage IV cancer. Gastrointestinal (GI) cancers were the most common, comprising 51.2% (n=300) of cases, followed by breast cancer (10.1%, n=59), genitourinary cancers (8.5%, n=50), gynecological cancers (6.3%, n=37), and lung cancer (5.5%, n=32). Less fre-quent categories included brain and nervous system cancers (4.6%, n=27), connective tissue and head and neck cancers (each 3.9%, n=23), hematological malignancies (2.9%, n=17), and skin cancers (0.7%, n=4). Unknown or double primary origins accounted for 2.4% (n=14). Detailed cancer diagnoses are presented in Table 2.

3.2. Terminal Admissions

The primary reasons for the last admission of palliative care patients were documented as follows: deteri-oration

Table 1. Demographics of the Study Population

Characteristics	N (%)
Sample size	586 (100)
Sex	
Male	306 (52.2)
Female	280 (47.8)
Age	
<65	235 (40.1)
>65	351 (59.9)
Age at presentation (years)	
Mean ± SD 66.82 ± 15.8	
Range 16-107	
Solid Cancer- Stage IV	466 (79.5)
Solid Cancer- Stage III	103 (17.5)
Hematologic Malignancy	17 (2.9)

in performance status was the most common, accounting for 28.8% (n=169) of cases. Gastrointestinal symptoms were reported in 21% (n=123) of cases. Altered level of consciousness was noted in 13.3% (n=78) of admissions, while respiratory reasons accounted for 16.6% (n=97). Anemia was observed in 1.5% (n=9) of cases. Other causes constituted 18.8% (n=110) of the total admissions.

The length of stay ranged from 1 to 361 days, with a mean of 21.64 ± 15 days. A total of 39 patients (6.7%) died within 48 hours of admission, while 125 patients (21.3%) had a stay of 30 days or longer (Table 3).

3.2.1. Admissions due to respiratory symptoms

Among the respiratory reasons for admission, pneumonia accounted for 86.3% (n=69) of cases, followed by pulmonary embolism at 8.8% (n=7) and pleural effusion at 6.3% (n=5).

3.2.2. Admissions due to gastrointestinal symptoms

Among the gastrointestinal reasons for admission, vomiting was the most frequent, accounting for 36.2% of cases within this category. Malignant bowel obstruction (MBO) followed at 23.4%, with jaundice representing 17.0% of cases. Upper gastrointestinal bleeding (UGIB) accounted for 12.8%, diarrhea for 6.4%, and dysphagia for 4.3%.

3.2.3. Admissions due to other causes

For other reasons of admission, pain was the most frequent, representing 26.4% (n=29) of the cases within this category. Sepsis or urinary tract infections (UTIs) accounted for 17.3% (n=19), while ascites and seizure or neurological complications were each observed in 10% (n=11). Acute kidney injury (AKI) or electrolyte disturbances were noted in 6.4% (n=7), while elective respite admission accounted for 5.5% (n=6). Details of the other reasons for admission are presented in Figure 1 for clarity and proportional distribution.

3.3. Associations between malignancy subtypes and causes of admission

The analysis identified distinct associations between specific malignancies and their primary reasons for admission. Gastrointestinal (GI) symptoms were strongly associated with GI malignancy (n=84, $p < 0.01$) and colorectal malignancy presenting as malignant bowel obstruction (n=6, $p < 0.01$). Dysphagia was significant in patients with thyroid cancer (n= 1, $p < 0.01$). In contrast, GI symptoms were negatively associated with musculoskeletal malignancies (n=1, $p < 0.05$), lung cancer (n=0, $p < 0.01$), and brain malignancy (n=1, $p < 0.05$). Respiratory symptoms, including pneumonia, demonstrated significant associations with tongue cancer (n=1, $p < 0.01$) and skin cancer (n=2, $p < 0.05$), while pneumonia showed a negative association with GI malignancies (n=23, $p < 0.01$). Hepatic encephalopathy was strongly linked to liver cancer ($p < 0.01$), and jaundice was significantly associated with cholangiocarcinoma (n=5, $p < 0.01$). Diarrhea was significantly associated with bladder malignancy (n=1, $p < 0.05$), pulmonary embolism was also observed in bladder malignancy cases (n=1, $p < 0.05$). Neurological symptoms, particularly seizures, were predominantly observed in brain cancer (n=6, $p < 0.01$). Associations between malignancy types and admission reasons listed in Table 4.

Urinary and renal symptoms were notable in colorectal cancer with urine retention (n=3, $p < 0.05$) and in neuroendocrine and prostate malignancies with electrolyte imbalance and acute kidney injury (n= 2 and 1, respectively, $p < 0.01$). Investigative recalls were strongly associated with lymphoma and squamous cell carcinoma (n= 4 and 1, respectively, $p < 0.01$) and also significantly linked to nasopharyngeal cancer (n=1, $p < 0.05$).

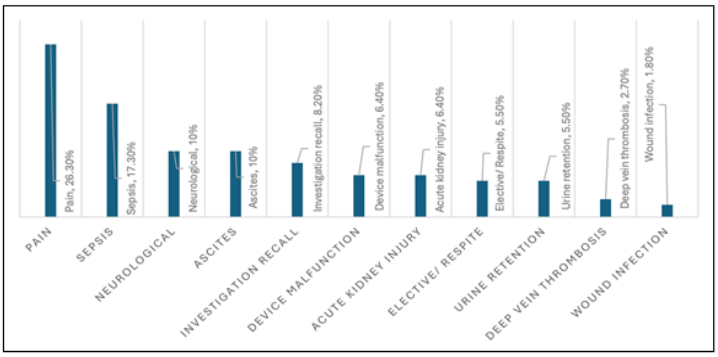


Figure 1. Summary of other Causes of Terminal Admissions

Table 2. Type of Primary Cancer

	N	%
Breast Cancer	59	10.1
Colorectal Cancer	105	17.9
Liver Cancer	66	11.3
Pancreatic Cancer	54	9.2
Gastric Cancer	17	2.9
Sarcoma	23	3.9
Endometrial Cancer	16	2.7
Ovarian Cancer	14	2.4
Brain Cancer	26	4.4
Esophageal Cancer	8	1.4
Cholangiocarcinoma	44	7.5
Bladder Cancer	16	2.7
Prostate Cancer	20	3.4
Cervical Cancer	6	1
Renal Cell Carcinoma	14	2.4
Thyroid Cancer	12	2
Lung Cancer	32	5.5
Neuroendocrine Tumor	5	0.9
Nasopharyngeal Cancer	4	0.7
Squamous Cell Carcinoma	5	0.9
Lymphoma	12	2
Leukemia	5	0.9
Neuroblastoma	1	0.2
Intestinal Cancer	1	0.2
Unknown Primary	11	1.9
Double Primary	3	0.5
Melanoma	4	0.7
Laryngeal Cancer	1	0.2
Tongue Cancer	1	0.2
Cancer of the vulva	1	0.2
Total	586	100

Additionally, wound infections were strongly associated with squamous cell carcinoma (n=1, $p < 0.01$). Device malfunctions demonstrated significant associations with cholangiocarcinoma (n=2, $p < 0.05$) and strong links to thyroid malignancy and squamous cell carcinoma (n=1 for both, $p < 0.01$).

4. Discussion

In this retrospective cohort of cancer patients under palliative care who died during hospitalization, we identified several important patterns in terminal admission. The most common cause of admission was deterioration of performance status, followed by gastrointestinal and respiratory symptoms. There were associations between the type of cancer patients had and the symptoms they were likely to present with. Finally, a significant proportion of patients experienced prolonged hospital stays.

Almost a third of patients were admitted due to deterioration of performance status. This decline is consistent with the recognized final pathway in cancer, where disease burden and organ failures lead to functional loss [9]. Cachexia, worsening nutritional status, increasing pain and depression are all likely to contribute [10]. Additionally, a caregiver survey found that many feel overwhelmed and unable to manage sudden worsening of symptoms, which often leads them to seek hospital care [7]. In some cases, the absence of accessible alternatives such as hospice or nursing facilities that can manage these symptoms means the hospital becomes the only ideal option. This may partly explain why our cohort had a median hospital stay of ~22 days and over 20% of patients were hospitalized for ≥30 days in their final admission: once admitted, patients often remained in the hospital until death because of limited alternatives. This finding aligns with a Saudi Arabian study on hospital-based palliative admissions where prolonged terminal hospital

Table 3. Reasons for Admission and Length of Stay

Reasons for Admission	n (%)
Deterioration of Performance	169 (28.8)
GIT symptoms	123 (21.0)
Altered level of consciousness	78 (13.3)
Respiratory reasons	97 (16.6)
Anemia	9 (1.5)
Others	110 (18.8)
Length of Stay (Days)	
Mean ± SD 21.64 ± 15	
Range 1-361	
Admissions <48hrs	39 (6.7)
Admissions >30 days	125 (21.3)

stays were observed due to a lack of optimal outpatient palliative support [11]. Furthermore, the high frequency of gastrointestinal disturbances leading to hospitalization is unsurprising given that GI cancers comprised over half of our cohort. Pneumonia also emerged as a leading cause of admission. These findings align with large international studies consistently identifying vomiting, pneumonia, and malignant bowel obstruction as predominant reasons for hospitalization in cancer patients [12-14]. Such patterns highlight opportunities to enhance palliative care and prevent terminal hospitalizations in advanced cancer.

An important implication of these findings is the potential to prevent a subset of end-of-life admissions through earlier palliative care integration and advanced care planning. Many of the hospitalizations we observed may be avoidable with timely outpatient intervention or hospice enrollment. A practical approach to implementing earlier palliative care referral is utilizing the internationally validated 11-item consensus checklist for outpatient specialty palliative cancer care, which flags objective triggers prompting automatic palliative-care referral [15]. Multiple randomized clinical trials have demonstrated that introducing palliative care early in the course of advanced cancer leads to improved performance status, higher quality of life, and reduced health care service utilization [16-18]. In practice, this means palliative teams should be co-managing patients alongside oncology well before the terminal phase, addressing symptoms proactively. Our cohort was under palliative care management, yet the fact that all patients still died in hospital suggests there is further room to strengthen palliative care in the community setting. Internationally, a wide range of community based initiatives have been introduced to improve end-of-life experiences: home-hospitalisation (HHOSP) for palliative patients, rapid-access palliative clinics, 24/7 Home Emergency Response Team (HERT), hybrid tele-palliative care and hospice at home services were all associated with fewer hospital bed days in the terminal phase of life [19-21]. Our findings advocate for scaling up such community-based palliative models in Saudi Arabia. If patients have accessible alternatives such as the ability to call a palli-ative nurse at 2 AM for advice on severe dyspnea, or a home health care visit when symptoms spike, they may avoid going to the hospital. Similarly, including palliative care specialists in EDs can help redirect patients to hospice or inpatient palliative units rather than general wards when they present in crisis [22]. Strengthening these systems-level approaches aligns with the vision of integrated oncology and palliative care, which leading organizations like the American Society of Clinical Oncology (ASCO) and European Society For Medical Oncology (ESMO) endorse as a standard of high-quality cancer care [16].

Expanding such palliative programs allows for proactive management by anticipating common presenting symptoms, helping prevent crisis-driven hospital visits. For instance, in our study, patients with GI cancer were more likely to be admitted with gastrointestinal symptoms. Anticipating this pattern allows for early outpatient management, such as ensuring access to antiemetics,

Table 4. Distribution of Clinical Presentations Across Cancer Types

Primary Malignancy	Deterioration of performance	GIT symptoms	Altered Level of Consciousness	Anemia and Blood Loss	Respiratory symptoms	Others
			Count (P-value)			
Breast	17 (1)	8 (0.135)	5 (0.230)	0 (0.317)	15 (0.057)	14 (0.317)
Gastrointestinal	82 (0.424)	84 (<0.001)	45 (0.32)	7 (0.11)	32 (<0.001)	50 (0.194)
Musculoskeletal	10 (0.11)	1 (0.046)	0 (0.057)	0 (0.549)	5 (0.484)	7 (0.134)
Gynecological	10 (0.764)	12 (0.072)	2 (0.134)	0 (0.424)	9 (0.194)	4 (0.194)
Brain and CNS	7 (0.764)	1 (0.021)	6 (0.162)	0 (0.484)	5 (0.764)	8 (0.134)
Genitourinary	19 (0.134)	11 (0.841)	7 (0.841)	0 (0.368)	8 (0.92)	5 (0.089)
Head and neck	8 (0.549)	1 (0.046)	2 (0.484)	0 (0.549)	5 (0.484)	7 (0.134)
Lung	10 (0.764)	0 (0.003)	4 (0.92)	0 (0.484)	11 (0.005)	7 (0.617)
Hematological	3 (0.317)	2 (0.368)	3 (0.617)	1 (0.134)	2 (0.617)	6 (0.072)
Unknown primary	1 (0.134)	3 (0.617)	3 (0.162)	0 (0.689)	3 (0.317)	1 (0.424)
Double primary	2 (0.162)	0 (0.368)	0 (0.484)	0 (0.841)	0 (0.424)	1 (0.549)
Skin	0 (0.194)	0 (0.317)	1 (0.484)	1 (<0.001)	2 (0.072)	0 (0.317)
Total	169	123	78	9	97	110

including the option for intravenous administration at home by healthcare professionals, as well as timely interventions for constipation or subacute obstruction to help prevent hospitalization. Similarly, patients with lung cancer were more likely to present with respiratory symptoms, highlighting the need for more aggressive outpatient strategies such as early use of oxygen therapy, opioids to relieve dyspnea, paracentesis for pleural effusions, and home-based intravenous antibiotics.

In addition to healthcare delivery interventions, the routine incorporation of goals-of-care discussions and advance care planning early and repeatedly is important to improve end-of-life outcomes. Evidence strongly suggests that patients who engage in end-of-life discussions with their clinicians are more likely to utilize hospice services and less likely to receive aggressive care in the final days, with no increase in anxiety or depression [3]. In contrast, when end-of-life discussions do not take place, patients are more likely to receive aggressive care that confers little benefit [3]. Moreover, a meta-analysis of 33,541 deceased cancer patients found that ACP reduced the odds of any terminal-phase hospital admission, ICU use and in-hospital death, while simultaneously increasing timely hospice uptake [23]. Thus, one implication of our work is that on-cology and palliative teams should collaborate to identify patients at high risk of decline and proactively discuss scenarios and preferences for end-of-life care before the patient deteriorates to the point of emergency admission.

From a clinical practice standpoint, our data also suggest a need to educate and support families of advanced cancer patients more intensively. Prior studies have documented that families often believe the patient will receive better care in the hospital or feel safer having medical professionals immediately available [1]. This emphasizes the importance of effective communication: healthcare providers should counsel patients and families on what palliative resources are available, what symptoms can be managed at home, and when hospitalization would or would not improve the situation. Numerous studies have shown that educating and actively supporting family caregivers can significantly lower unplanned costs during the last two years of life, alleviate symptoms and reduce hospitalisations [24, 25]. Structured psycho-educational interventions could help family members and caregivers to anticipate, identify and cope with a situation as an expected crisis, rather than an emergency and perhaps influence decisions to go to the emergency department [26].

Limitations of this study should be acknowledged when interpreting the results. First, the retrospective de-sign carries inherent biases. We relied on documentation in medical records to determine the primary reason for admission and other clinical details, which can be subjective or inconsistently recorded. The patient's exact wishes or the family's motivations are not fully captured in charts, meaning our analysis is missing the patient's perspective. This is a common challenge in end-of-life research: patients who are imminently dying cannot be interviewed, and surrogate reporting may either underplay or overestimate certain symp-toms. Second, this was a single-center study at a specialized tertiary care hospital. Our patient population and practices such as having an inpatient palliative care consult team may differ from other smaller hos-pitals, whether in Saudi Arabia or elsewhere. We did not have a comparative of patients who died out of hospital, which could have provided context on how our hospitalized cohort might differ from those man-aged at home. For instance, patients who avoided terminal hospitalization may have had more robust family support or received earlier palliative care input, factors we could not address. Moreover, we did not formally measure certain outcomes like quality of death or family satisfaction which would be valuable to correlate with the care setting. Finally, the sample sizes for some subgroups in the association between cancer types and reasons for admission were small, and thus these associations should be interpreted with caution rather than as definitive causal relationships.

In conclusion, our study found that patients with advanced cancer were most commonly admitted during their final hospitalization due to declining performance status, followed by gastrointestinal and respiratory symptoms. Those with gastrointestinal and lung cancers were more likely to be admitted for GI and respiratory dis-turbances, respectively. Most patients experienced prolonged hospital stays. These findings highlight the need for earlier integration and strengthening of outpatient palliative care services to help prevent terminal hospitalizations at the end-of-life in cancer patients.

Author Contributions

Conceptualization, B.A., M.O., M.A. and H.S.; methodology, M.A.; formal analy-sis, M.A.; resources, H.S.; data curation, B.A., L.A., A.A., A.S.A., S.A., R.A., M.A., and A.A.; writ-ing original draft preparation, B.A., L.A., M.A., M.O., and O.A.; writing review and editing, M.O. and O.A.; supervision, M.O., M.A., and H.S.; project administration, H.S. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement

This study was approved by the Institutional Review Board at King Abdullah Inter-national Medical Research Center (KAIMRC) and the ethics committee at the Ministry of National Guard-Health Affairs under the approval number IRB: NRR24-011-6. All methods were conducted in accordance with relevant guidelines, including the "Declaration of Helsinki" and the "Saudi Arabian Law of Ethics on Living Creatures." Data was securely stored and was accessible only to the primary investigator and co-investigators. No identification of correspondents was included in the dataset.

Informed Consent Statement

Patient consent was waived by the KAIMRC ethics committee due to the retrospective nature of the study.

Data Availability Statement

The data presented in this study are available on

request from the corre-sponding author due to institutional regulations.

Conflicts of Interest

The authors declare no conflicts of interest.

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