



Original Article

The characteristics of geriatric patients managed within the resuscitation unit of a district-level emergency centre in Cape Town

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ABSTRACT

Introduction: The world's population is aging and this trend is also seen in South Africa. This increase will invariably affect acute care services. The geriatric population attending emergency centres have not been described in the South African setting. The objective was to describe the characteristics of geriatric patients presenting to the resuscitation unit of a district-level hospital in Cape Town.

Methods: All patients (≥ 65 years) managed within the resuscitation unit of Khayelitsha Hospital over an 8-month period (01 January–30 August 2018) were retrospective analysed. Data were collected from the Khayelitsha Hospital Emergency Centre database and by means of a retrospective chart review. Summary statistics are presented of all variables.

Results: A total of 225 patients were analysed. The median age was 71.1 years, 148 (65.8%) were female and all were residing in their family home. The majority ($n = 162$, 72%) presented outside office hours, 124 (55.1%) arrived by ambulance, and 94 (41.8%) had presented to the emergency centre within the previous year. Only half the patients ($n = 114$, 50.7%) were triaged as very urgent or higher. Most patients ($n = 169$, 75.1%) were admitted by in-hospital services and the in-hospital mortality was 21.8% ($n = 49$). Diseases related to the circulatory system ($n = 54$, 24.0%) were the most frequent primary diagnosis and acute kidney injury were the most frequent secondary diagnosis ($n = 101$, 44.9%). The most common comorbidities were hypertension ($n = 176$, 78.2%) and diabetes ($n = 110$, 48.9%), and 99 (44%) had three or more comorbidities. Polypharmacy (≥ 5 medications) occurred in 100 (44.4%) patients with 114 (50.7%) using medications from three or more different classes. The prevalence of hypernatremia was 2.6% and for hyponatremia 54.4%.

Conclusion: Geriatric patients managed within the resuscitation unit of a district-level hospital had a high return rate, multiple comorbidities and a high prevalence of polypharmacy and hyponatraemia.

Introduction

The world's population is aging. The global average life expectancy has increased by 5.5 years between 2000 and 2015, with the largest increase (9.4 years) seen in Africa. The global life expectancy for children born in 2015 was 71.4 years, and although it varies by country, is projected to increase to 77 years by 2050 [1,2]. In South Africa, the life expectancy of a person born in 2019 is estimated to be 61.5 years for males and 67.7 years for females [3]. The Western Cape province has the highest average life expectancy for males (65.7 years) and females (71.1 years), and currently is home to an estimated 447,000 elders (6.5% of the province's population) [3].

Geriatric patients often present with unique and complex symptomatology that may be daunting for many clinicians [4]. The clinical

challenges include vagueness of symptoms, altered cognitive function, and multiple comorbidities. Complications often arise from polypharmacy due to drug-drug interactions, drug-disease interactions, adverse drug effects and toxicities [5]. Geriatric patients are also at high risk of dehydration with associated hypernatremia, which are often complicated by acute kidney injury and a subsequent increased risk of death [6,7]. The elderly are also prone to falls leading to injuries and fractures. This may be related to musculoskeletal disorders (e.g. lack of muscle strength, osteoporotic age-related changes), neurological disorders (e.g. previous stroke, loss of proprioception), visual disturbances and even side-effects from polypharmacy [8]. The long-term management of geriatric patients are further complicated by the dependency on family and friends, a general lack of will to seek medical attention due to the often intimidating processes in the medical system, and obstacles in

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transitioning back into the community post discharge [9,10].

The challenges that accompany geriatric patients cannot be ignored and reconsideration of how to manage acutely ill geriatric patients is ongoing worldwide. Some centres have created Comprehensive Geriatric Assessment (CGA) units to focus on the medical, psychological and social aspects of care, and include multi-disciplinary emergency center-based teams that consists of physiotherapists, occupational therapists, social workers, community nurses, junior physicians and experienced geriatricians [11].

The proportion of geriatric patients presenting to emergency centres in Sub-Saharan Africa has increased [12], and emergency medical systems must adapt to ensure the provision of adequate acute care. Limited data is available that describe geriatric patients presenting to emergency centres in South Africa, and no data exists regarding geriatric patients living in very poor communities where many are staying in informal dwellings with limited access to water and electricity. Identifying patterns of acute care utilization specific to the geriatric population could be key to ensure adequate and timely access to health care and to improve health outcomes. The aim of the study was to describe the characteristics of geriatric patients (≥ 65 years) presenting to the resuscitation unit of a district-level hospital in Cape Town.

Methods

A retrospective analysis of a prospectively collected observational database was conducted. This was supplemented by a chart review to limit missing data and to include additional variables.

Khayelitsha Hospital is a 300-bed district-level hospital situated about 34 km from Cape Town's city centre. It serves a health district of approximately 500,000, with a population density of 10,120 persons/km² [13]. The population consist of 98.6% Black African and 1.6% are elderly (>65 years) [13]. Khayelitsha health district covers one of the largest informal housing settlements with high levels of unemployment and extremely low-income households. Khayelitsha Hospital's emergency centre is larger than that of a standard district hospital in the Western Cape [15,16], and serves about 3500 patients per month; of which 20% are high acuity geriatric patients [14]. A five-bed (including one paediatric cot) resuscitation unit is incorporated within the emergency centre. Patients are admitted to the resuscitation unit based on clinician discretion, as well as a high acuity score according to the South African Triage Scale [15].

The electronic Khayelitsha Hospital Emergency Centre database is a prospectively collected observational database capturing all patients managed within the resuscitation unit since 1 November 2014 [14]. Data are captured electronically, are coded and stored onto a password protected server. A decoding sheet is separately stored.

All geriatric patients (≥ 65 years) who were managed within the resuscitation unit of Khayelitsha Hospital over an 8-month period (01 January–30 August 2018) were eligible for inclusion. Patients with missing folders or incorrect folder numbers were excluded.

Data were collected by a single investigator after obtaining a decoded cleaned extract of the database (with all non-geriatric cases removed). Missing data and new variables were incorporated by reviewing patients' electronic clinical records. A standardised data collection form was used (supplementary material 1). Data were not verified due to a lack of resources.

Patient acuity was measured using the South African Triage Scale, which categorises patients as Emergency (Red), Very urgent (Orange), Urgent (Yellow), and Non-urgent (Green) [15]. Diseases were categorised based on the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). Polypharmacy was defined as the concurrent use of ≥ 5 medications by a patient. Hyponatremia was defined as a serum sodium level > 145 mmol/L and hyponatremia as a serum sodium level ≤ 135 mmol/L. All-cause in-hospital mortality included patients that died of any cause since arriving to the emergency centre.

Summary statistics were used to describe all variables. Categorical data was summarised using frequency counts or percentages, and distributions of variables were presented as two-way tables or bar charts. Medians were used as the measures of central tendency for continuous responses and quartiles as indicators of spread. Analyses were done using SPSS Statistics for Windows, Version 26.0 (IBM Corp. Released 2019. Armonk, NY: IBM Corp.). Incomplete data points were excluded from analyses.

The study has been approved by the Health Research Ethics Committee of Stellenbosch University (Ref: N19/09/119).

Results

A total of 3657 patients were managed within the resuscitation unit over the study period, of which 248 (6.8%) patients were 65 years of age or older. Twenty-three patients were excluded (dead on arrival $n = 10$, incorrect folder number $n = 13$) and 225 patients were analysed. The median (25th–75th percentile) age at presentation was 71.1 (68.2–77.3) years (male 72.45 years, female 70.34 years). Patients were mostly female ($n = 148$, 65.8%) and all were residing in their family home (missing $n = 1$, 0.4%) (Table 1). The majority of patients presented outside office hours ($n = 162$, 72%) (supplementary material 2). Ninety-four (41.8%) patients visited the emergency centre within the previous year, of whom 24 (10.7%) presented three times or more (maximum visits = 7). All patients transferred to facilities capable of providing a higher level of care had medical (non-traumatic) conditions. The in-hospital mortality rate was 21.8% ($n = 49$), of whom 14 died within the resuscitation unit.

Diseases related to the circulatory system ($n = 54$, 24.0%) were the most frequent primary diagnosis followed by endocrine, nutritional and metabolic diseases ($n = 47$, 20.9%), diseases of the respiratory system ($n = 31$, 13.8%), and diseases of the nervous system ($n = 29$, 12.9%) (Table 2). The top five circulatory-related diseases were hypertension, ischemic heart disease, congestive cardiac failure, atrial fibrillation and hypertensive heart disease. Most deaths occurred in patients with diseases related to the circulatory system ($n = 12$, 24.5%). Diseases of the genitourinary system (all acute kidney injury) were the most frequent secondary diagnosis ($n = 101$, 44.9%), and was the secondary system with the most deaths ($n = 25$, 51.0%) (Table 2). A breakdown of the primary ICD-10 diagnostic categories are presented in supplementary material 3.

The most common co-morbidities were hypertension ($n = 176$, 78.2%) and diabetes ($n = 110$, 48.9%) (Table 3). Eighteen patients (8.0%) had no comorbidities, 40 (17.8%) had one comorbidity, 68 (30.2%) had two comorbidities, and 99 (44%) had three or more comorbidities. Six patients (2.7%) had six co-morbidities each. Hypertension and diabetes were also the most frequent comorbidity among those that died, 36 (73.5%) and 17 (34.7%) respectively (Table 3).

Polypharmacy occurred in 100 (44.4%) patients, with a maximum of 13 drugs being taken by one patient. Forty-one patients (18.2%) did not use any chronic medication, while 24 (10.7%) used one medicine, 15 (6.7%) used two medications, 20 (8.9%) used three medications and 25 (11.1%) used four medications. Forty-one patients (18.2%) used medications from one class, 29 (12.9%) from two classes, 41 (18.2%) from three classes and 73 (32.5%) from 4 or more different classes. Among the patients on anti-hypertensive medication, 81.3% (117/144) were taking two or more different anti-hypertensive drugs (Table 4). The most frequent drug taken per class was a diuretic (121/144, 84.0%), a biguanide (64/83, 77.1%), aspirin (73/80, 91.3%), and paracetamol (45/52, 86.5%) (Supplementary material 4).

In total, 140 (62.2%) patients received intravenous fluids, 100 (44.4%) received antibiotics, and 23 (10.2%) were treated with non-invasive positive pressure ventilation. Only 2 (0.9%) patients were intubated and ventilated.

The results of laboratory tests performed on arrival to the resuscitation unit are presented in Table 5. Hyponatremia was present in 6

Table 1
Demographics and characteristics of geriatric patients managed within the resuscitation unit of Khayelitsha Hospital over an 8-month period.

	n (%) unless otherwise specified
Gender	
Male	77 (34.2)
Female	148 (65.8)
Age, median (Q1-Q3) ^a	
Years	71.1 (68.2–77.3)
Residence	
Home	224 (99.6)
Unknown	1 (0.4)
Patient acuity ^b	
Emergency (Red)	47 (20.9)
Very urgent (Orange)	67 (29.8)
Urgent (Yellow)	74 (32.9)
Non-urgent (Green)	37 (16.4)
Mode of transport	
Emergency medical services	124 (55.1)
Private	49 (21.8)
Unknown	52 (23.1)
Admission category	
Medical	207 (92.0)
Trauma	18 (8.0)
Mechanism of injury	
Falls	12 (66.7)
Other causes of trauma	6 (33.3)
Vital signs	
Systolic blood pressure (mmHg), median (Q1-Q3) ^{a,c}	134 (108–159)
Diastolic blood pressure (mmHg), median (Q1-Q3) ^{a,c}	77 (58–93)
Respiratory rate (breaths/min), median (Q1-Q3) ^{a,d}	20 (18–23)
Heart rate (beats/min), median (Q1-Q3) ^{a,c}	95 (77–113)
Glasgow Coma Scale < 15 ^c	80 (35.6)
Blood glucose	
Blood glucose (mmol/L), median (Q1-Q3) ^e	8.2 (5.7–13.5)
Hypoglycaemia (<3.0 mmol/L) ^e	8 (3.8)
Hyperglycaemia (>11.0 mmol/L) ^e	29 (13.7)
Disposition from resuscitation unit	
Discharged directly home	9 (4.0)
Managed by emergency centre staff outside resuscitation unit	30 (13.3)
Referred to in-hospital services within Khayelitsha Hospital	146 (64.9)
Referred to tertiary facilities	23 (10.2)
Died in resuscitation unit	14 (6.2)
Unknown	3 (1.3)
Time intervals, median (Q1-Q3) ^a [maximum]	
Time to being triaged (minutes)	5 (1–10) [186]
Time to resuscitation unit (hours)	0.8 (0.3–4.3) [60]
Time to physician consult (hours)	1.3 (0.5–3.3) [25]
Length of stay, median (Q1-Q3) ^a [maximum]	
In resuscitation unit (hours)	6.4 (3.4–12.5) [42.8]
In hospital (days)	2.4 (0.7–5.4) [29.5]

^a 25th – 75th percentile.

^b According to the South African triage Scale.

^c n = 224.

^d n = 220.

^e n = 211.

(2.6%) patients, while hyponatremia was evident in 122 (54.4%) patients.

Discussion

This study describes the characteristics of geriatric patients managed within the resuscitation unit of a district-level hospital. Two thirds of the patients were female, 92% of patients had at least one co-morbidity, and 42% had visited the emergency centre within the previous year. Despite half of the patients being triaged as low acuity, the majority of patients were admitted to in-hospital specialist services and the all-cause in-hospital mortality was 22%. Both polypharmacy (44%) and hyponatraemia (54%) occurred frequently. Acute kidney failure was a major

Table 2
Diagnostic categories of geriatric patients admitted to the resuscitation unit of Khayelitsha Hospital over an 8-month period.

ICD-10 ^a code	Primary diagnosis n (%)	Died in hospital n (%)	Secondary diagnosis n (%)	Died in hospital n (%)
I Certain infectious and parasitic diseases	17 (7.6)	5 (10.2)	2 (0.9)	0 (0)
II Neoplasms	7 (3.1)	2 (4.1)	1 (0.4)	0 (0)
IV Endocrine, nutritional and metabolic diseases	47 (20.9)	9 (18.4)	3 (1.3)	2 (4.1)
V Mental and behavioural disorders	0 (0.0)	0 (0)	5 (2.2)	1 (2.0)
VI Diseases of the nervous system	29 (12.9)	9 (18.4)	0 (0.0)	0 (0)
IX Diseases of the circulatory system	54 (24.0)	12 (24.5)	6 (2.7)	0 (0)
X Diseases of the respiratory system	31 (13.8)	7 (14.3)	12 (5.3)	2 (4.1)
XI Diseases of the digestive system	6 (2.7)	2 (4.1)	1 (0.4)	0 (0)
XII Diseases of the skin and subcutaneous tissue	8 (3.6)	2 (4.1)	1 (0.4)	1 (2.0)
XIII Diseases of the musculoskeletal system and connective tissue	1 (0.4)	0 (0)	0 (0.0)	0 (0)
XIV Diseases of the genitourinary system	3 (1.3)	0 (0)	101 (44.9)	25 (51.0)
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	1 (0.4)	0 (0)	0 (0.0)	0 (0.0)
XIX Injury, poisoning and certain other consequences of external causes	19 (8.4)	0 (0)	0 (0.0)	0 (0)
Unknown	2 (0.9)	1 (2.0)	0 (0.0)	0 (0)
None	0 (0.0)	0 (0)	93 (41.3)	18 (36.7)
Total	225 (100)	49 (100)	225 (100)	49 (100)

^a International Statistical Classification of Diseases and Related Health Problems 10th Revision.

Table 3
Co-morbidities of geriatric patients admitted to the resuscitation unit of Khayelitsha Hospital over an 8-month period.

Co-morbidity	All n (%)	Died in hospital n (%)
Hypertension	176 (78.2)	36 (73.4)
Diabetes	110 (48.9)	17 (34.7)
Chronic kidney disease	34 (15.1)	5 (10.2)
Ischemic heart disease	24 (10.7)	3 (6.1)
Cerebrovascular accident	24 (10.7)	8 (16.3)
Cancer	13 (5.8)	4 (8.2)
Chronic obstructive pulmonary disease	11 (4.9)	1 (2.0)
Human immunodeficiency virus	10 (4.4)	2 (4.1)
Dementia	6 (2.7)	1 (2.0)
Other	80 (35.6)	15 (30.6)

contributor to mortality.

A substantial number of patients (41.8%) visited the emergency centre within the past year and is similar to Canadian study (43.9%) [16]. However, in the latter study the population sample was derived from tertiary and community-level hospitals and based on stable (non-critical) patients that presented during day-time on weekdays. Similar to our study, females and those living at home frequently revisited the emergency centre, as did those with concomitant diabetes and heart disease. The study also indicated that people living with depression had multiple return visits; this could have been missed in our study as it is not routinely assessed in the emergency centre. Other possibilities for return visits are incomprehensive discharge plans, unimplemented palliative protocols, misuse of the emergency care system or inadequate primary and community care systems [16,17].

Table 4

Number of medicines taken by class in geriatric patients managed within the resuscitation unit of Khayelitsha Hospital.

Number of drugs taken per class	Drug class					
	Anti-hypertensive n (%)	Anti-diabetic n (%)	Anti-coagulation and anti-platelet n (%)	Lipid-lowering (statin) n (%)	Analgesia n (%)	Other n (%)
0	81 (36)	142 (63.1)	145 (64.4)	151 (67.1)	173 (76.9)	139 (61.8)
1	27 (12)	50 (22.2)	71 (31.6)	74 (32.9)	30 (13.3)	48 (21.3)
2	49 (21.8)	31 (13.8)	9 (4.0)	0 (0.0)	21 (9.3)	18 (8)
3	46 (20.4)	2 (0.9)	0 (0.0)	0 (0.0)	1 (0.4)	10 (4.4)
4	21 (9.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.3)
≥5	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (3.1)

Table 5

Laboratory test results of geriatric patients managed within the resuscitation unit of Khayelitsha Hospital.

	n	Median (Q1-Q3) ^a [Maximum]	Reference range
Sodium (mmol/L)	207	133 (129–137) [147]	136–145
Potassium (mmol/L)	203	4.1 (3.7–14.8) [8.3]	3.5–5.1
Urea (mmol/L)	207	9.4 (5.4–17.6) [55]	2.1–7.1
Creatinine (umol/L)	211	118 (74–197) [1206]	49–90
White cell count	208	10.2 (7.29–14.48) [53.3]	3.9–12.6
Haemoglobin (g/dL)	205	11.9 (10.1–13.3) [18.1]	11.6–16.4
Mean corpuscular volume (fL)	205	89.9 (85.0–94.0) [111.7]	78.9–98.5

^a 25th – 75th percentile.

Only half the patients (50.7%) managed in the resuscitation unit were triaged as needing very urgent or emergent care (Table 1). District-level healthcare facilities in South Africa do not have high care units and the resuscitation unit is often the only non-theatre area where patients can be monitored continuously. It is thus a limited, highly sought-after resource and its inappropriate use needs to be identified and rectified. The South African Triage Scale does not incorporate advanced age and it might well be under triaging geriatric patients. Similarly, other triage tools also don't incorporate advanced age [18,19], but a pre-hospital triage tool for geriatric trauma patients found that a substantial number of patients (58%) actually do qualify to be treated at a specialised trauma centre [20]. A small decrease (0.5%) in mortality was witnessed in mildly injured patients, but mortality did not change significantly in severely injured patients [20].

Patients stayed in the resuscitation unit for approximately six hours with the longest duration of stay almost two days. This is concerning as slow patient turnover could reflect inefficiencies in the hospital system such as delays with support services (radiology and laboratory), access block, tertiary transfer difficulties as well as an imbalance of staff to patient ratios [21–23]. More than half the patients that required in-hospital admission only stayed around two and a half days. This questions the necessity of these admissions as opposed to whether the patients could have benefited from a comprehensive geriatric assessment in the emergency centre before being discharged home [11].

Polypharmacy occurred frequently and mostly comprised of anti-hypertension and anti-diabetic medications. This is expected, as the South African National Health and Nutrition Survey (SANHAES-1) reported an increase in the prevalence of non-communicable diseases in South Africa, mainly hypertension (16.5%), diabetes (5%) [24]. A previous South African study indicated that polypharmacy was associated with adverse drug events in 20% of geriatric presentations [25]. The frequently implicated drug classes were cardiovascular (34%), anticoagulant (27%), analgesics (19%), and anti-diabetic (9%) [25]. The study further indicated that over-the-counter medications and traditional medicines were used frequently and also contributed to polypharmacy [25]. The lack of an effective system makes it difficult for physicians to determine which medications patients are using and whether they are appropriate; thereby increasing the risk of over-prescribing.

Inappropriate prescriptions in the South African geriatric population had a 13% prevalence, and mainly related to oestrogen, amitriptyline, benzodiazepines, nonsteroidal anti-inflammatory drugs (NSAIDs) and proton-pump inhibitors (PPIs) [26]. A country-specific guideline, similar to the internationally used BEERS list or STOPP/START criteria [27,28], would be helpful to prevent inappropriate prescribing in the elderly.

Hyponatremia occurred in 2.6% (n = 6) of patients, which is less than the 3.5% prevalence previously described in the geriatric population, [29,30] but higher than the 1.5% prevalence in the general South African population [31]. Similar to our findings, hyponatremia was associated with hypovolemia and sepsis [29–31]. Hyponatremia occurred in 54.5% (n = 122) of patients and is much higher than previously published data from international studies where the prevalence of hyponatremia ranged between 17% and 34% in geriatric patients managed in acute care settings [32–34]. Common factors associated with hyponatremia are age-related impaired salt-water balance, chronic thiazide diuretic use, idiopathic syndrome of inappropriate antidiuretic hormone and endocrinopathies [35]. We did not attempt to identify the exact cause of the high prevalence of hyponatremia in our setting, and further studies are needed to better understand and potentially address this finding.

Renal impairment (acute and chronic) were frequently present and a major contributor to mortality. Renal replacement therapy is strictly rationed in the South African public healthcare sector with an incidence of 4.4 per million population despite an end-stage kidney disease prevalence of 66 per million population [36]. Although a specific age is not part of the exclusion criteria for chronic renal replacement therapy, very few elderly patients are on or qualify for the renal replacement programme. The median age of patients on renal replacement therapy in the public sector is 45.1 years [37].

Study limitations

Several factors may have influenced the results of this study. The strengths of the study include the use of a single trained abstractor (not blinded to the study objective), a standardised data collection sheet, and well defined variables. The use of a second reviewer and assessing the interrater agreement would have improved the validity of the results; this was unfortunately not feasible due to limited resources. Diagnostic codes (ICD-10) were used as a surrogate measure of disease and might not be entirely accurate. We did not attempt to quantify any potential misclassifications and subsequent bias that could have resulted from either the validity of the diagnosis made or the association between the diagnostic code and the actual diagnosis. Chronic medication data were only taken from the patients' hospital records and did not include the records from community healthcare centres where patients collect their chronic medication; it is thus possible that the frequency of polypharmacy could be even higher than recorded. Included patients were limited to the resuscitation section of the emergency centre and might not be reflective of the emergency centre as a whole. Lastly, the study was done in a single emergency centre with a unique demographic profile and the results might not be generalizable to different settings.

Conclusion

Geriatric patients managed within the resuscitation unit of a district-level hospital had a high return rate, multiple comorbidities and a high prevalence of polypharmacy and hyponatraemia. The persistent growth in the geriatric population and their unique age-related complications will continue to increase the burden on the emergency care system. Geriatric-friendly processes should be considered to ensure that geriatric patients are appropriately triaged and managed in the acute care setting, while systems need to be put in place to limit polypharmacy and over-prescribing. Comprehensive geriatric management plans might decrease frequent re-admission to the emergency centre.

Dissemination of results

Results from this study was shared with the management team at Khayelitsha Hospital.

Authorship contribution statement

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: NS contributed 60%, DJvH 35%; and EE contributed 5%. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of competing interest

The authors declared no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.afjem.2021.11.005>.

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