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Assessing predictive factors of the patient's length of stay in the emergency room of Yaoundé Central Hospital, Cameroon

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We *a*ssessed whether the emergency room at Yaoundé Central Hospital (YCH) met international standards; while analyzing factors that are associated with the length of stay, a key performance indicator of the emergency medicine department. Based on the data of patient admissions and discharges recorded from February 2017 to June 2018 in the emergency room of YCH, data was extracted from about two thousand research subjects; then an observational, non-randomized, cross-sectional study was conducted. The mean length of stay was 23.73±0.634 hours in the emergency room of YCH. Using binomial logistic regression analysis, the diagnostic severity was positively associated with a long length of stay when controlled for other factors, OR_a=1.65, p=0.037; bed availability in the peripheral care units, however, did play a confounding role in the relationship, p=0.026. Furthermore, the analysis of the variances showed that less than 1% of the change that occured in the mean length of stay was explained by sociodemographic factors alone; whereas, less than 6% of that change was due to clinical factors. The patient's mean length of stay in the emergency room of YCH did not meet international standards. Sociodemographic and clinical factors could not alone explain 93% of the observed long length of stay. We should look for other inputs from factors such as patient's financial capacity or health insurance availability, protocols of care, diagnostic and therapeutic effectiveness.

Key words: Emergency medicine department, patient's length of stay, performance indicator, predictive factors, observational cross-sectional study, low middle income country.

INTRODUCTION

Managing a healthcare organization requires performance control and quality improvement. This assumption reveals a dire need for evidence-based data on the performance of the healthcare units (Greg et al.,

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2010; Chamberlain and Pollack, 1998; Cameron et al., 2011; Sorup et al., 2013). Among patient care units, emergency medicine department (EMD) represents one of the most sensitive places where indicators can shed light on the performance, henceforth help enhance quality control and improve the organization's management policy. In the emergency room (ER), the length of stay (LOS) is the elapsed time between the admission and discharge of a patient. Previous research studies had indicated that the LOS could be a relevant performance indicator of the structure and procedure in the ER (Kusumawati et al., 2019; Alemu et al., 2019; Rahman et al., 2015). The structure of the ER refers to the diagnostic equipment such as laboratory and radiology services, drugs and beds availability in the ER and peripheral care units. The procedure on the other hand, is the protocols of care or the decision-making steps that guide healthcare providers on duty (Rahman et al., 2015). Thus, assessing the patient's LOS could provide reliable information on structural and procedural aspects of the health care unit in charge of acute health conditions. It was in this context, that Kusumawati et al. (2019) had studied the average LOS in ER of Yogyakarta, Indonesia. They found it at 5.5 h, and factors like disease acuity levels, specialist consult and needs of admission to other care units were associated with increased time spent in the ER. In Ethiopia, Alumu et al. (2019) had found the LOS to be higher than 24 h due to inadequacy of bed availability in patient ward, overcrowding, lack of laboratory tests and delayed radiological procedures. In their study, Nanayakkara et al. (2014) in the ER of Australia and New-Zealand, had evaluated the length of patient's stay before being transferred to another care unit. The median LOS ranked between 2.5 and 5.1 h, according to the decision-making method and after adjustment with diagnosis, type of health facility and its geographical location. In Denmark, Sorup et al. (2013), had led a systematic review of many research articles, on fourteen selected items, time intervals and measures associated with the patient predominantly were in the performance measures identified in the American, British, Swedish and Canadian articles. The LOS, time between patient arrivals and first clinical review, and time between patient arrivals and their first clinical examination were highlighted by many articles. Among fifty-five identified EMD performance measures, the intervals of time spent in the ER were the most recommended performance measurement (Rose et al., 2016; Schroeder et al., 2016; MacFarlane and Benn, 2003).

In Cameroon, we were unable to identify a published research study on this topic. However, Garga and Ongolo-Zogo (2013) had published a backgrounder strategy to inform discussions between policymakers and stakeholders, about the strategic options and considerations, to improve reception and management of emergencies in national and regional hospitals; but, the authors did not carry out an evaluation of the performance indicators of any EMD. Thus, the lack of published work in Cameroon has provided the rationale for conducting a research study of the predicting factors associated with the patient's average LOS in the ER of Yaoundé Central Hospital.

METHODOLOGY

Study design

An observational cross-sectional study using secondary data that was collected by the nursing staff of the ER, then stored in the registration books of patient admissions and discharges. The study duration ran from February 2017 to June 2018; within that period, we extracted data of nine months from the registration books.

Choice of the healthcare facility

The Yaoundé Central Hospital (YCH) was opened in 1933 as the Central Africa Hospital and is one of the oldest clinics in Cameroon. It is located within the administrative square of the capital city of Cameroon and hosts many medical specialties, including the Intensive Care Unit (ICU), the Emergency Medicine Department (EMD), and the High Standing Pavilion for upper-class personalities. The EMD admits about two thousand patients annually; more information on YCH can be found on the hospital website (Yaoundé Central Hospital, https://www.hopitalcentral.cm).

Study participants

Participants were any person who sought medical attention in the ER.

Inclusion criteria

All individuals admitted in the ER by the triage nurse and whose sociodemographic and clinical data were collected during the study period.

Exclusion criteria

(1) Any person recorded as dead upon arrival in the ER;
(2) Patient's file classified as damaged or empty.

Sampling method and size

A non-randomized, non-stratified convenient sampling method was used to select our study participants. It was not necessary to compute our sample size since we were able to secure a large sample. As an observational study, we opted for a large sample bigger than one thousand research subjects to reduce both the impact of missing data, and a type II statistical error. We extracted data from 1987 study participants. However, four hundred and twenty eight persons were reported dead upon arrival at ER triage station and were excluded from the final sample.

Table 1. Description of socio-demographic factors of the length of stay in the ER of YCH.

LOS	Category	N (%)	Mean	SEM	Mean 95% CI	P*	η²	MD (%)
Sex	Female	648 (53.33)	23.92	0.887	21.91-25.35			170
	Male	567 (46.67)	23.45	0.904	22.05-25.64			173
	Total	1215 (100)	23.73	0.634	22.50-24.96	0.670	0.000	343 (22.01)
Age	<30	229 (19.93)	21.2	1.297	18.62-23.74			
	30-60	555 (48.30)	24.5	0.915	22.65-26.32			
	>60	365 (31.77)	23.9	1.237	21.45-26.34			
	Total	1149 (100)	23.62	0.646	22.35-24.89	0.156	0.003	409 (26.25)
Income levels	Low	181 (18.99)	23.22	1.621	20.02-26.44			
	Middle	691 (72.51)	23.10	0.791	21.64-24.76			
	High	81 (8.50)	20.59	2.156	16.65-25.38			
	Total	953 (100)	22.91	0.676	21.59-24.23	0.652	0.001	605 (38.83)

N =Number; SEM = Standard error of the mean; *p-value are issued from Kruskal Wallis test; MD = Missing data; LOS = Length of stay in hour; % = Percentage; 95%CI= Ninety five percent confidence interval; age in year"<" = Lower than; ">" = Higher than; η2 = Coefficient of determination Eta. Source: Data from the EMD of Y.

Variables

The outcome variable is the patient's LOS. It was expressed as a quantitative and categorized variable in linear and logistic regressions, respectively. Class levels were "long" versus "short" stay in hours, with short-stay being the class reference. A long stay was defined as higher than 24 h and short stay if otherwise. Since data on arrival and discharge times were not recorded, the median LOS obtained from descriptive statistics was retained as the cut-off point to categorize the LOS. The only quantitative variable among sociodemographic factors (SDF), "age". It was categorized in three class levels, young if less than 30-year-old, adults between 30 and 60 and elder if higher than 60-year-old. Family annual income levels were defined following the patient profession by low, middle, and high income.

All clinical factors (CF) were quantitative variables including the nursing team that recorded the data. Our main explanatory variable of the patient's LOS was the diagnosis, made by the ER attending physicians and was categorized in two class levels "severe" and "mild"; severe when clinical decompensation of chronic diseases, shock or impaired consciousness were present; mild if otherwise. Clinical outcomes were categorized in "transfer", "left without being seen (LWBS)" and "death occurring after admission". Transferred patients were those admitted in the peripheral care unit or discharged with the consent of the physician to return home. The nursing teams were labeled as A, B, C, D, and unknown teams (UK). The label of the UK team was assigned when the nurse staff who recorded the data forgot to indicate the team's label.

Statistical methods

We performed descriptive statistics for quantitative variables to assess the central tendency (mean or median) and the spread or dispersion (standard deviation or standard error of the mean). We computed proportions of qualitative variables.When the quantitative variables LOS and "age" followed a normal distribution, the logarithmic transformation was not required to perform a linear regression analysis. We assessed the variances of the patient's

average LOS among categories of SDF and within class levels of SDF and CF through analysis of variances using the Kruskal Wallis test.

Finally, we used a binomial logistic regression to look for a possible alternative explanations of the association between diagnosis and the average LOS, adjusted for covariates in a multivariate analysis. All decisions with respect to our research hypothesis were made based on the statistical significance p-value less or equal to 0.05, issued provided either by the Chi-square test or Fisher exact test for logistic regression, and non-parametric Kruskal Wallis test for analysis of variances. Missing data (MD) were treated as "missed" in all statistical analyses using IBM-SPSS software version 20.

RESULTS

Data was extracted from 1986 research subjects in which 21.55% (428) were found dead upon arrival to the ER and were excluded from the study following our selection criteria. The final sample size was made of 78.45% (1558). The average patient's LOS was 23.73 [22.49-24.79 h] and the mean age was 48.89 [47.89-49.89] year-old results not displayed in (Table 1).

Description of sociodemographic factors (SDF) of the LOS

The mean difference within each SDF was statistically non-significant explaining why the mean LOS did not change when it was adjusted for SDF. Consistently, the coefficient of determination (η²) showed that the proportion of variance in the mean LOS that can be

explained by SDF was around 0.0%; 0.3% and 0.1% for gender, age, and income, respectively.

Description of clinical factors (CF) of the LOS

The median LOS for each CF widely varies from 2 to 48 h (Figures 1 and 2). The mean LOS according to CF (Table 3) showed no mean difference within clinical outcome categories (p=0.572); however, the mean difference was statistically significant within diagnosis (p=0.001), PCUA (p=0.008) and nursing team (p=0.002) categories; providing the evidence of change in the LOS when adjusted for CF. The coefficients of determination showed that the proportions of variances of the LOS that can be explained by clinical factors as 0.1 %; 1.2 %; 3.4 %; and 5.3% for clinical outcomes, nursing teams, diagnoses, and PCUA, respectively (Table 2). Those proportions are higher than those observed with SDF. Except for patient clinical outcome and nursing team, our main explanatory factor, the diagnosis has been consistently related to the LOS.

Furthermore, the findings of Figure 1 showed many outlier points above the median LOS. It was found out that a patient ranked number 1486th had spent 168 hour in the ER, representing a stay of one week, suffering from an endocrinology condition, and was later on transferred to the diabetic care unit (Figure 2). It could be assumed that the number 1486th might have suffered from a severe decompensation of diabetes, could neither leave the ER sooner, nor pay four hundred dollars, a preexisting condition for admission to the intensive care unit. On the other hand, the 1433 and 316th patients suffering from an endocrinology and neurology conditions, respectively, each of them had spent 144 h, representing six days before the former (1433th) went to the cardiology unit, and the latter (316th) left the ER without physician approval or LWBS. We could assume that a lack of beds in the neurology care unit forced 1433th patient for admission into the cardiology care unit, which was inappropriate for this patient, whereas 316th patient left without physician approval probably because of financial hardships.

Are there any confounding/interaction factors in the relationship between LOS and diagnosis?

A binomial logistic regression modeling was conducted to assess the effect size of this association, potential confounding and interaction factors (Table 4). In univariate analysis, only the variables nursing team and diagnosis severity were statistically significant, p=0.044, 0.037 respectively; while age and PCUA were marginally significant, p=0.069, 0.078 respectively, associated with the increased stay in the ER. In multivariate analysis, the age factor has lost its marginal association (p=0.069;

0.420), the PCUA however, showed significant statistical association with a long stay (p=0.078; 0.026). Also, the effect size of the association between diagnosis severity and increased LOS shows more than 10% change in the crude $OR_c=1.47$ and adjusted $OR_a=1.67$; suggesting that the PCUA could be a potential confounding factor. These results suggested that the mean LOS varying from one diagnostic class to another, with patients who suffered from endocrinologic and neurologic conditions having the longest stay. In addition, there was no evidence of association between SDF and LOS.

DISCUSSION

The LOS is four-time longer in the ER of YCH compared to international standards where the median LOS varies between 2 and 6 h (Sorup et al., 2013; Kusumawati et al., 2019). Meeting international standards can be daunting for some ER of many some low-and-middle income countries. Like Yaoundé Central Hospital, findings from another study conducted in southern Ethiopia had shown an increased time spent in ER, Our results showed the mean LOS varying from one diagnostic class to another; findings that are consistent with what Nanayakkara et al. (2014) and Sorup et al. (2013) had reported in Australia and Denmark, respectively. Conversely, PCUA was found to be the only possible confounding factor in the relationship between diagnostic severity and a long stay in the ER of YCH. More often, patients got stuck in the ER for lack of beds in the peripheral care unit. The so-called "Hebergement" or temporary housing is a common procedure where the patients are transferred to an unfitted peripheral care unit to wait for admission as a bed becomes available in the qualified peripheral care unit(https://www.indexmundi.com/cameroon/hospital_bed _density.html). We were unable to find an evidence of association between SDF and LOS. Rose et al. (2016), also reported the absence of direct impact of SDF on the patient's LOS. As an LMIC, Cameroon has not yet implemented universal health coverage, we thought income levels could have a tremendous impact on the patient's LOS in the ER of YCH; surprisingly, like the gender and age factors, it was not the case in this study.

In the present study, we find the diagnostic severity; bed unavailability in peripheral care units and for some extends a poor financial capacity to be linked with the long stay in the ER of Yaoundé central hospital.

Study advantages and relevance

This study sheds light on the performance of an EMD by providing concrete evidence-based information on various factors that may help to predict the LOS in the ER

Table 2. Description of clinical factors of the length of stay in the ER of YCH.

| LOS (h)	Category	N (%)	Mean	SEM	95% CI mean	P*	η²	MD (%)
Nursing team	A	289	26.04	1.512	23.07-29.02			
	B	279	24.02	1.276	21.51-26.53			
	C	247	24.34	1.190	22.00-26.68			
	D	218	24.15	1.591.3	21.00-27.59			
	UK	181	18.25	1.387	15.52-20.99			
	Total	1214	23.73	0.634	22.50-24.96	0.002	0.016	344 (24.45)
Clinical	LWBS	78	25.59	3.033	20.15-35.24			
	Death	134	23.07	1.976	18.47-27.01			
Outcome	Transfer	965	23.88	0.679	22.71-26.02			
	Total	1177	23.90	0.633	22.66-25.14	0.572	0.001	381 (24.45)
PCUA	Cardiology unit	130	23.40	2.045	18.01-28.63			
	Gastroenterol unit	204	22.77	1.349	20.25-26.60			
	Infectious D unit	33	32.42	4.542	21.61-42.21			
	Neurology unit	68	22.12	2.115	16.42-26.83			
	Emergency-S unit	30	12.40	2.832	6.40-20.91			
	Rheumatology unit	29	25.31	4.417	16.24-39.63			
	Hematology unit	42	21.29	2.896	15.81-30.40			
	Intensive care unit	28	17.29	3.553	7.90-24.64			
	Diabetic unit	37	38.54	5.327	30.84-58.43			
	Endocrinology unit	4	30.50	11.057	5.61-74.24			
	other	556	24.03	0.908	22.14-26.32			
	Total	1161	23.82	0.636	22.57-25.07	0.008	0.056	397 (25.48)
Diagnosis	CPNS	219	24.03	1.599	21.23-27.62			
	Cardiovascular syst	67	24.66	3.507	17.80-27.75			
	Digestive system	172	21.49	1.465	18.61-24.54			
	Respiratory system	42	21.29	2.896	15.42-27.14			
	BJM system	30	24.73	4.322	14.91-32.93			
	Nephrourology syst	16	21.62	4.659	9.94-25.84			
	Endocrine system	89	35.06	2.936	29.52-41.73			
	Urogenital system	5	6.40	4.400	22.20-40.92			
	HEENT/stomatologie	6	25.00	12.008	8.15-67.32			
	Hematology	63	25.71	2.655	19.84-31.02			
	Infectious diseases	108	22.70	1.659	20.44-27.72			
	Cancer	30	20.87	4.182	12.30-29.42			
	Other	8	18.75	5.6810	5.25-32.22			
	Total	855	24.26	0.775	22.74-25.78	0.001	0.030	703 (45.12)

N = Number; SEM = Standard error of the mean; Syst= System; p-value = Level of significance; *p-value are issued from Kruskal Wallis nonparametric; MD = Missing data; LOS = Length of stay; % = Percentage; UK= Nursing team that collected the data, but omitted to provide its label; CPNS= Central and peripheral nervous system; BJM= Bone, Joint, and Muscle system; LWBS= Left Without Being Seen; 95%CI= Ninety-five percent confidence interval; PCUA = Peripheral Care Unit Admission; η2 = Coefficient of determination; other is any patient outcome: lwbs, dead, discharged home, admitted to another healthcare facility; HEENT= Head, Ears, Eyes, Nose and Throat; Gastroenterol= Gastroenterology unit; Emergency-S unit= Emergency surgical unit; Other= Unlabeled diagnosis, any diagnosis that couldn't fit in other systems, like "allergy", "alcohol intoxication" "hysteria", etc. Source: Data from the EMD of YCH.

of a healthcare facility in a LMIC. The results could lead to decision-making capacity in the sense that enhances patient quality of care. Accounting for a few published studies in the field of EMD in LMIC, this pioneering work
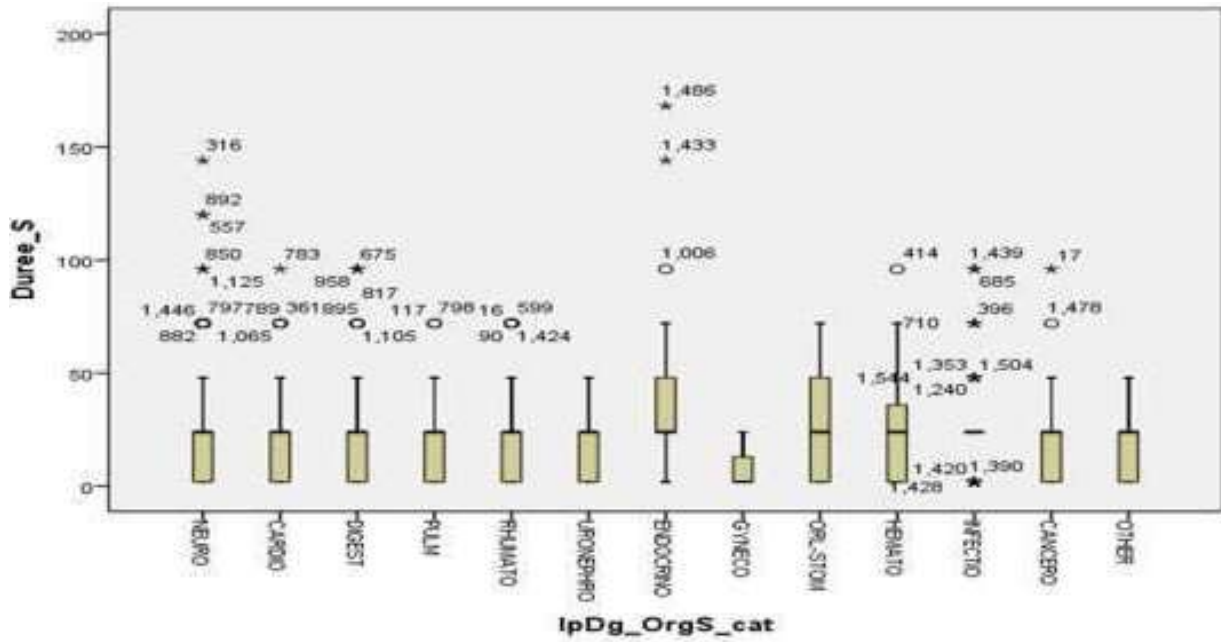
Figure 1. Box plots of the length of stay according to the diagnosis by organ system showing some outlier points without statistical leverage on the medians. IpDg_OrgS_cat=Diagnosis; Duree_S=Lengthofstayin hour; Pulm=Pulmonary.
Source: Data from the EMD of YCH.
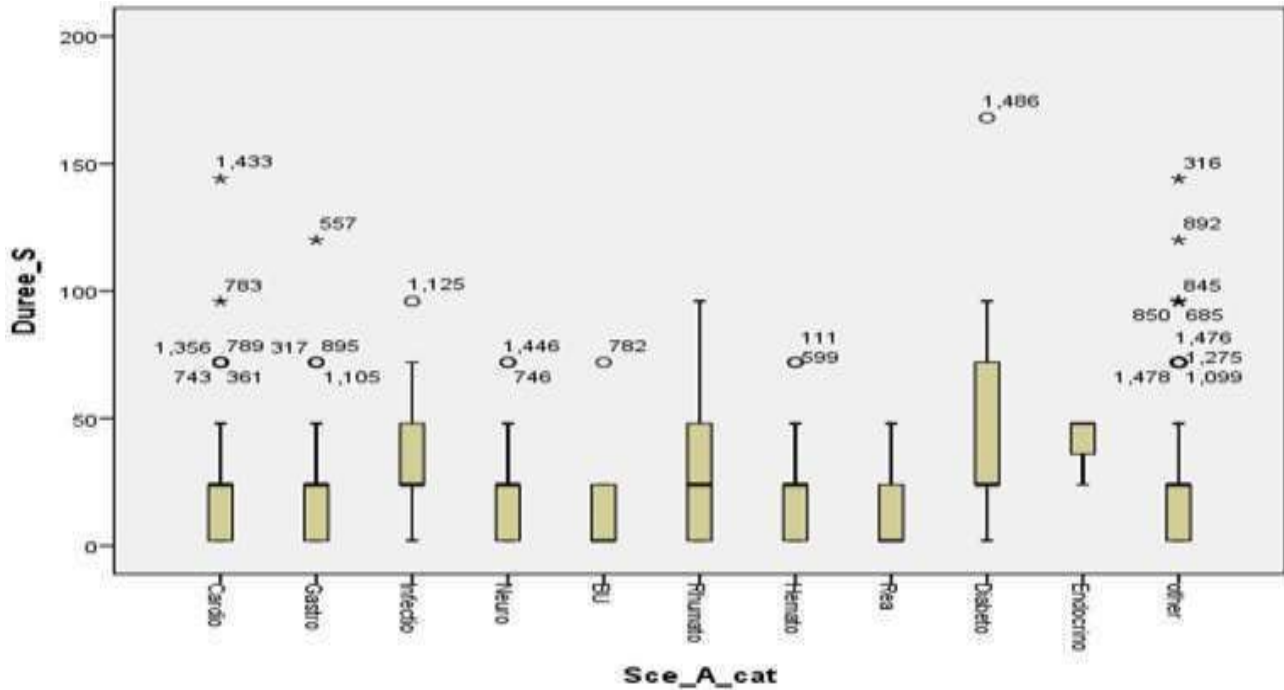
Figure 2. Box plots of the length of stay according to peripheral care unit admissions, showing some outliers LOS without statistical leverage on the Median. Sce_A_cat= Peripheral care unit admission; Duree_S=Length of stay; BU= Emergency surgical unit; Rea= Intensive care unit; Gastro=Gastro-enterology unit; Cardio=Cardiology unit; Infectio= Infectious disease unit; Diabeto= Diabetic unit; Neuro: Neurology unit; Rhumato=Rheumatologyunit; Endocrino=Endocrinology unit.
Source: Data from the EMD of YCH.

Table 3. Study of association between the LOS and Diagnosis adjusted for covariates in univariate and multivariate logistic regression analysis.

Variable/Class	LOS [n (%)]		Univariate analysis			Multivariate analysis		
	Long (>24 h)	Short (ref.)	OR_c	95%CI	p	OR_a*	95% CI	p
Nurse team	**240 (19.8)**	**972 (80.2)**	-	-	**0.044**	-	-	0.486
A	63 (21.9)	226 (78.2)	2.12	1.25-3.62	0.006	1.90	0.89-4.05	0.423
B	56 (20.2)	221 (79.3)	1.93	1.12-3.32	0.017	1.67	0.79-3.54	0.827
C	50 (20.2)	197 (79.8)	1.93	1.12-3.35	0.019	2.20	1.02-4.73	0.315
D	50 (22.9)	168 (77.1)	2.27	1.30-3.95	0.004	1.73	0.73-4.07	0.820
UK (ref.)	21 (11.6)	160 (88.4)	1	-	-	1	-	-
Age cat	**226 (19.7)**	**921 (80.3)**	-	-	**0.069**	-	-	0.420
< 30	36 (15.7)	193 (84.3)	0.84	0.54-1.31	0.449	0.86	0.39-1.89	0.711
30-60	124 (22.4)	430 (77.6)	1.30	0.93-1.82	0.121	1.50	0.88-2.54	0.134
> 60 (ref.)	66 (18.1)	298 (81.9.)	1	-	-	1	-	-
Sex-cat	**240 (19.8)**	**970 (80.2)**	-	-	-	-	-	-
Female	134 (20.7)	512 (79.3)	1.13	0.85-1.50	**0.397**	1.03	0.67-1.59	0.729
Male (ref.)	106 (18.8)	458 (81.2)	1	-	-	1	-	-
Income lev	**178 (18.7)**	**773 (81.3)**	-	-	**0.803**	-	-	0.775
Low	37 (20.4)	144 (79.6)	1.13	0.58-2.20	0.718	1.71	0.64-4.53	0.282
Middle	126 (18.3)	563 (81.7)	0.99	0.54-1.78	0.959	0.96	0.42-2.20	0.914
High (ref.)	15 (18.5)	66 (81.5)	1	-	-	1	-	-
Diagnosis	**169 (19.9)**	**680 (80.1)**	-	-	-	-	-	**-**
Severe	119 (22.1	420 (77.9)	1.47	1.02-2.12	0.037	1.65	1.04-2.61	0.033
Mild (ref.)	50 (16.1)	260 (83.9)	1	-	-	1	-	-
PCUA	235 (20.3)	924 (79.7)	-	-	0.078	-	-	0.026
Outcome	**239 (20.4)**	**935 (79.6)**	-	-	**0.301**	-	-	0.346
LWBS	21 (27.3)	56 (72.7)	1.51	0.89-2.55	0.125	1.93	0.88-4.23	0.152
Death	26 (19.7)	106 (80.3)	0.99	0.63-1.56	0.957	1.39	0.65-2.96	0.943
Transf (ref.)	193 (19.9)	773 (80.1)	1	-	-	1	-	-

The OR was given only for each category but not for the variable itself. Too many categories for PCUA is the reason there is no OR displayed for this variable. In logistic regression the reference category has an OR equal to "1". LOS=Length of stay; OR_c= Crude Odds Ratio; OR_a=Adjusted Odds Ratio; p=p-value from Chi-square test; 95%CI=ninety-five percent confidence interval; PCUA= Peripheral Care Unit Admission; "-"= Not available; Ref.: Reference category; n=Frequency or number of patients; Transf= Transfer; LWBS= Left without being seen.
Source: Data from the EMD of YCH.

could pave the way for further researches especially in Cameroon. Although we could not assess the impact of health insurance on the patient's average LOS in the ER was to raise awareness on the main urgency of the moment in healthcare, which is the necessity for implementing universal health coverage in LMIC like Cameroon.

Study limitations

The patient's LOS could have been misestimated in our study. The lack of data on the time the patient was admitted and discharged (Cameron et al., 2011; Sorup et al., 2013; Rose et al., 2016) constrained us to assign a default stay of 24 h to any patient who was discharged the next day, if admitted the day before. However, some of those patients could have been admitted in the evening and discharged the next morning, leading to a short stay.

Furthermore, the lack of data on the patient's capacity to pay for health related bills rendered difficult to assess the impact of the healthcare expenses on the LOS. The results showed that only 2.4% of patients were admitted

Table 4. Study of association between the LOS and DOS adjusted for covariates in univariate and multivariate logistic regression analysis.

Variables/ Classes	LOS n (%)		Univariate analysis			Multivariate analysis		
	Long (>24h)	Short (ref.)	OR_C	95%CI	p	OR_a*	95% CI	p
Nurse team	**240 (19.8)**	**972 (80.2)**	-	-	**0.044**	-	-	0.486
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D	50 (22.9)	168 (77.1)	2.27	1.30-3.95	0.004	1.73	0.73-4.07	0.820
UK (ref.)	21 (11.6)	160 (88.4)	1	-	-	1	-	-
Age cat	**226 (19.7)**	**921 (80.3)**	-	-	**0.069**	-	-	0.420
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> 60 (ref.)	66 (18.1)	298 (81.9.)	1	-	-	1	-	-
Sex-cat	**240 (19.8)**	**970 (80.2)**	-	-	-	-	-	-
Female	134 (20.7)	512 (79.3)	1.13	0.85-1.50	**0.397**	1.03	0.67-1.59	0.729
Male (ref.)	106 (18.8)	458 (81.2)	1	-	-	1	-	-
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High (ref.)	15 (18.5)	66 (81.5)	1	-	-	1	-	-
Diagnosis	**169 (19.9)**	**680 (80.1)**	-	-	-	-	-	**-**
Severe	119 (22.1)	420 (77.9)	1.47	1.02-2.12	**0.037**	1.65	1.04-2.61	**0.033**
Mild (ref.)	50 (16.1)	260 (83.9)	1	-	-	1	-	-
PCUA	235 (20.3)	924 (79.7)	-	-	**0.078**	-	-	**0.026**
Outcome	**239 (20.4)**	**935 (79.6)**	-	-	**0.301**	-	-	0.346
LWBS	21 (27.3)	56 (72.7)	1.51	0.89-2.55	0.125	1.93	0.88-4.23	0.152
Death	26 (19.7)	106 (80.3)	0.99	0.63-1.56	0.957	1.39	0.65-2.96	0.943
Transf (ref.)	193 (19.9)	773 (80.1)	1	-	-	1	-	-

in the Intensive care unit (ICU), compared to 17.6% and 11.2% for gastroenterology and cardiology units, respectively. At Yaoundé central hospital, while the admission in peripheral care units like cardiology and gastroenterology is free of charge, a down-payment of about four hundred dollars is required for admission in the ICU, a preexisting condition that too many patients could not afford. As a result, the lack of financial resources might have deterred the access of many severe health conditions to the ICU and reciprocally extended their stay in the ER; an assumption that could support a dire need of Universal Health Coverage (World Health Organization, 2017).

Finally, information bias could have occurred during the process of categorizing patient's income levels. The students were classified as lower income however, their parents who may be wealthier are the ones paying the student's healthcare bills. The same reasoning applies for the housewife status, considered as middle income patients in this study, when their partners could have been classified as either lower, middle or higher income. Thus, the likelihood that a differential misclassification occurred is higher in this study, a bias that could have led to a diluted estimate of the effect size, shifting the association between the LOS and family income towards the null.

Conclusions

Although some biases have been highlighted, this pioneering study in Cameroon provides evidence-based

information on factors associated with the increased length of stay in the ER of Yaoundé Central Hospital. When compared with study conducted in other parts of the world, there is a broad number of factors that varies from one country to another. These factors such as diagnostic severity, bed unavailability in peripheral care units, lack of diagnostic and therapeutic capability, and poor financial capacity can substantially increase the mean length of stay in the ER of a Low and middle income country. In the ER of YCH diagnostic severity was strongly associated with increased length of stay in the emergency room and the bed unavailability in peripheral care units played a confounding role in that relationship. In addition, less than 1% of the change that occurred in the mean LOS was explained by socio-demographic factors; while only about 6% of that change accounted for clinical factors. These findings provide a rationale for conducting new study designs that would assess other structural and procedural factors, including the impact of universal health coverage on the remaining 93% unexplained change of the mean LOS in ER of Yaoundé Central Hospital (Liu et al., 2013; Hung and Chalut, 2008; World Health Organization, 2017).

ETHICAL CONSIDERATIONS

The Director of Yaoundé Central Hospital granted a written contract N°088/DHCY/CM/CG, for this study. In order to prevent the leak of patient information from occur occurring, each patient identifier was matched to a numeric code and kept secret. The principal investigator claims to be an external, independent evaluator who was neither closely nor furtherly associated to the management of clinical or administrative affairs of the Yaoundé Central Hospital.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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