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Original Research Article

Invasive and Non-Invasive Oscillometric Blood Pressure Monitoring in Septic Patients in a Sub-Saharan African Intensive Care Unit: The Case of Douala General Hospital

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Abstract: ***Introduction***: Blood pressure (BP) monitoring is central to the hemodynamic management of septic patients. Invasive monitoring remains scarcely available in resource-limited settings. Our objective was to compare invasive and oscillometric BP in septic patients, under static and dynamic conditions, at Douala General Hospital. ***Patients and Methods***: We conducted a prospective observational study in patients aged ≥18 years admitted to the intensive care unit for sepsis or septic shock at DGH. Paired invasive and oscillometric BP measurements (systolic, SBP; diastolic, DBP; mean, MAP) were collected under static conditions and during four dynamic challenges (passive leg raising, norepinephrine titration, fluid challenge, end-expiratory occlusion test). Agreement was assessed using Pearson or Spearman correlation, and concordance using Bland-Altman analysis against AAMI/ESH/ISO criteria. A sensitivity analysis accounted for the clustering of measurements within patients. ***Results***: We measured 189 BP pairs in 16 patients (56.3% female; mean age 53.3 ± 17.1 years). Oscillometry underestimated SBP and MAP at low values and overestimated DBP. Oscillometric BP correlated with invasive values except during norepinephrine titration; MAP showed the best correlation ($r = 0.92$; $p < 0.001$). Only MAP during the end-expiratory occlusion test met AAMI/ESH/ISO standards, a finding confirmed on repeated-measures analysis although no longer significant at the individual level after correction ($r=0.47$; $p=0.14$; $k=5$). ***Conclusion***: Oscillometric BP correlated with invasive measurements in most conditions, especially for MAP, but the two methods were interchangeable only for MAP during the end-expiratory occlusion test. In the absence of invasive monitoring, oscillometric MAP can support clinical decision-making, provided its limitations are recognized, particularly during vasopressor titration.

Keywords: Monitoring, Invasive Blood Pressure, Oscillometry, Sepsis, Septic Shock.

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INTRODUCTION

Sepsis remains a major global public health problem: in 2017, it affected approximately 49 million people worldwide and was associated with 11 million deaths [1, 2]. Sub-Saharan Africa alone accounted for 40% of cases worldwide, with 39.5 to 47.2% mortality [3]. Accordingly, the World Health Organization (WHO) declared sepsis a global health priority [2].

Sepsis is a life-threatening organ dysfunction caused by a dysregulated host response to infection (SOFA score ≥ 2) [4]. Together with septic shock, it constitutes a medical emergency [5], managed through infection control and hemodynamic resuscitation [6]. Blood pressure (BP) monitoring is central to this hemodynamic resuscitation, as it allows assessment of the severity of hemodynamic instability, its evolution, and the response to treatment [7]. Surviving Sepsis Campaign recommendations are centered on invasive monitoring, and it is further suggested that additional fluid administration be guided by dynamic tests [5]. Despite these recommendations, only 52% of patients on vasopressors across 168 intensive care units (ICUs) in the United States received invasive BP monitoring [8].

In resource-limited settings, data on invasive BP monitoring are scarce, and it is often available only

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in certain facilities depending on the level of the healthcare pyramid. Moreover, dynamic tests are not systematically used in our setting. This observation motivated our interest in evaluating the more widely available non-invasive oscillometric measurement, by studying its correlation and concordance with invasive measurement in septic patients managed in the intensive care unit of Douala General Hospital (DGH), under static conditions as well as during dynamic tests.

PATIENTS AND METHODS

Study Design and Population

This was a prospective observational study conducted at DGH from January 1 to July 30, 2025, in the medical-surgical intensive care unit (ICU), under authorization n°0189/UY1/FMSB. Douala, the economic capital of Cameroon, is its largest city, with an estimated population of 4,346,000 in 2025 [9].

We included patients admitted to the ICU, fitted with a radial arterial catheter, of either sex, aged ≥18 years, admitted to the ICU within 24 hours with a diagnosis of sepsis or septic shock (Sepsis-3), and for whom written informed consent had been obtained from the patient or their legal representative. Patients in septic shock were on a stable vasopressor dose for at least 30 minutes. Patients with a contraindication to the use of an automated cuff on the arm contralateral to the arterial catheter (arteriovenous fistula, trauma, wounds, burns, or lymph node dissection…), a lower-limb amputation, or those with pre-existing heart failure or a condition involving intra-abdominal hypertension were excluded from the study.

Blood Pressure Measurement and Variables Studied

Non-invasive BP was measured by oscillometry using a cuff sized to arm circumference, connected to a monitor set to automatic measurement.

Invasive BP was measured via a 20G arterial catheter placed in the radial artery according to the department's protocol. The transducer was connected to the arterial line through a three-way stopcock and high-pressure tubing (300 mmHg), zeroed at the phlebostatic axis and fixed to the arm. All measurements were performed using Mindray BeneView T9 and IMEC 15 monitors. Three paired measurements were collected in total, following AAMI/ESH/ISO recommendations [10]. Invasive BP values were recorded at the moment the oscillometric measurements were completed.

For static measurements, patients were positioned at a 45° semi-recumbent angle, arms alongside the body and legs horizontal, under mechanical ventilation. Invasive (IBP) and non-invasive (NIBP) BP were measured simultaneously at 5-minute intervals over three cycles. This included systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP).

For dynamic measurements, during the passive leg-raising test, patients were transferred from a semi-recumbent position to a horizontal trunk position with the lower limbs raised to 45° for 4 minutes, with three paired measurements taken at 60-second intervals starting from the first minute of elevation. For norepinephrine titration, IBP values (SBP, DBP, MAP, pulse pressure, pulse pressure variation) and NIBP were measured simultaneously at 5-minute intervals over three cycles. For the fluid challenge, 250 mL of crystalloid was infused over 5 to 10 minutes, after which BP was measured at 5-minute intervals over three cycles, 20 to 30 minutes after the challenge. For the end-expiratory occlusion test, a 15-second pause was performed in deeply sedated patients without spontaneous ventilator triggering, with three paired measurements taken at 1-minute intervals thereafter.

The variables studied were BP values (SBP, DBP, and MAP). We also collected sociodemographic data (sex, age, body mass index), clinical data (medical history, infectious foci, and SOFA score), therapeutic data (type and volume of fluid resuscitation, number and type of vasopressor and/or inotrope used), and outcome data (length of hospital stay and mortality).

Statistical Analysis

The primary measures were measurement bias (mean of paired differences, invasive minus non-invasive measurement) and measurement precision (standard deviation of the bias). Normality was assessed using the Shapiro-Wilk test given our small sample size; paired means were compared using Student's t-test, and the association between invasive and non-invasive BP was assessed using Pearson's and Spearman's correlation coefficients as well as linear regression, under static and dynamic conditions. Bland-Altman analysis was used to assess concordance between invasive and non-invasive BP values under static and dynamic conditions by calculating limits of agreement (mean bias ±1.96 × standard deviation of the differences) [11–13], compared against AAMI/ESH/ISO validation criteria [10] (mean bias ≤± 5 mmHg, standard deviation of the bias ≤ ± 8 mmHg). In addition, at least 85% of differences were required to fall within ±10 mmHg. All BP values were presented as mean ± standard deviation, and categorical variables as frequencies. A p-value < 0.05 was considered statistically significant, with 95% confidence intervals.

We performed a pre-specified sensitivity analysis given the small sample size. Concordance was re-estimated using the Bland-Altman method for multiple observations per subject, which decomposes the variance of the differences into within- and between-patient components, and correlation was re-estimated using repeated-measures correlation (rmcorr), which removes between-patient variance by centering each patient's values on their own mean before correlating,

with degrees of freedom adjusted to N-k-1 (N=measurements, k=patients).

RESULTS

Patient Characteristics

We obtained 189 BP pairs from 16 patients admitted for sepsis or septic shock. Female sex predominated (56.3%), with a sex ratio of 0.8 (full characteristics in Table I). Mean qSOFA and SOFA scores at admission were 2.5 ± 0.5 out of 3 and 9.9 ± 3.2 out of 24, respectively, with a mean predicted mortality of 34.7 ± 26.2%. Mean lactate at admission was 3.9 ± 2.8 mmol/L. The lungs were the main primary infectious focus (56.3%). Balanced crystalloid Ringer's lactate was the preferred fluid (87.5%), with a mean daily volume of 38.5 ± 11.4 mL/kg. All patients received norepinephrine, at a mean dose of 1.3 ± 1.8 µg/kg/min. Ten patients (62.5%) were on mechanical ventilation, with a mean positive end-expiratory pressure of 5.1 ± 1.3 cmH2O. Mean length of stay was 5.1 ± 5.3 days, and mortality was 56.3% (Table I).

Table I: patient characteristics

Variables (N = 16)	Mean ± SD
Age (years)	53.25 ± 17.14
Sex — Female / Male	9 (56.3%) / 6 (43.7%)
Body mass index (kg/m²)	28.1 ± 4.9
qSOFA (/3)	2.5 ± 0.5
SOFA (/24)	9.9 ± 3.2
Predicted mortality (%)	34.7 ± 26.2
Lactate at admission (mmol/L)	3.91 ± 2.8
Daily fluid volume (mL/kg/24h)	38.5 ± 11.4
Mean norepinephrine dose (µg/kg/min)	1.3 ± 1.8
Mechanical ventilation	10 (62.5%)
Positive end-expiratory pressure (cmH2O)	5.1 ± 1.3
Mean duration of mechanical ventilation (days)	4.6 ± 4.3
Arterial catheter complications	0 (0%)
Mean length of stay (days)	5.1 ± 5.3
Patient outcome — Alive / Deceased	7 (43.7%) / 9 (56.3%)

Comparison of Paired Blood Pressure Measurements

Oscillometric DBP differed significantly from invasive DBP under static conditions, during norepinephrine titration, and during the end-expiratory occlusion test (overestimation of 4.5 to 5.1 mmHg in all three cases, p≤0.001). SBP and MAP differed significantly only during passive leg raising (6.2 ± 12.7 mmHg, p=0.003 and 3.0 ± 8.8 mmHg, p=0.036); no significant difference was observed for any parameter under the other conditions, nor during the fluid challenge (Table II).

Table II: Comparison of paired invasive and oscillometric blood pressure measurements (Student's t-test)

Condition	Parameter	Mean difference (mmHg)	SD	95% CI	t	p
Static	SBP	4.1	15.9	−0.5 to 8.7	1.8	0.081
Static	DBP	−4.5	8.0	−6.9 to −2.2	−3.9	<0.001
Static	MAP	2.0	8.2	−0.4 to 4.4	1.7	0.095
Passive leg raising	SBP	6.2	12.7	2.2 to 10.1	3.1	0.003
Passive leg raising	DBP	−1.4	10.1	−4.6 to 1.7	−0.9	0.363
Passive leg raising	MAP	3.0	8.8	0.2 to 5.7	2.2	0.036
Norepinephrine titration	SBP	3.9	16.9	−1.4 to 9.1	1.5	0.147
Norepinephrine titration	DBP	−4.8	9.0	−7.6 to −2.0	−3.5	0.001
Norepinephrine titration	MAP	2.0	12.2	−1.7 to 5.8	1.1	0.282
Fluid challenge	SBP	−1.2	24.0	−8.7 to 6.3	−0.3	0.750
Fluid challenge	DBP	−2.7	10.0	−5.8 to 0.4	−1.8	0.086
Fluid challenge	MAP	2.6	11.1	−0.9 to 6.0	1.5	0.139
End-expiratory occlusion	SBP	−2.5	10.8	−8.4 to 3.5	−0.9	0.391
End-expiratory occlusion	DBP	−5.1	4.5	−7.6 to −2.6	−4.3	0.001
End-expiratory occlusion	MAP	−2.3	6.0	−5.7 to 1.0	−1.5	0.156

Correlation between Invasive and Oscillometric Blood Pressure

Under static conditions, oscillometric measurements showed overall good correlation with invasive measurements, particularly for MAP. MAP showed the strongest and most consistent correlation with invasive values across all conditions (r=0.60–0.92, all p<0.001), especially during the end-expiratory

occlusion test. SBP and DBP were moderately to strongly correlated under most conditions, but more weakly during passive leg raising (SBP r=0.55, DBP r=0.40) and the fluid challenge (SBP r=0.32). Correlation was not significant for any of the three parameters during norepinephrine titration (r=−0.02 to 0.24, p≥0.12) (Table III).

Table III: correlation between invasive and non-invasive blood pressures

Condition	Parameter	r (Pearson/Spearman)	p
Static	SBP	0.56	<0.001
Static	DBP	0.65	<0.001
Static	MAP	0.79	<0.001
Passive leg raising	SBP	0.55	<0.001
Passive leg raising	DBP	0.40	0.008
Passive leg raising	MAP	0.61	<0.001
Norepinephrine titration	SBP	0.11	0.497
Norepinephrine titration	DBP	0.24	0.119
Norepinephrine titration	MAP	−0.02	0.909
Fluid challenge	SBP	0.32	0.040
Fluid challenge	DBP	0.69	<0.001
Fluid challenge	MAP	0.78	<0.001
End-expiratory occlusion	SBP	0.77	0.001
End-expiratory occlusion	DBP	0.93	<0.001
End-expiratory occlusion	MAP	0.92	<0.001

Concordance between Blood Pressures

Concordance analysis showed mean biases ≤ ±5 mmHg except for SBP during passive leg raising and DBP during the end-expiratory occlusion test (EEOT). MAP showed the best overall mean bias across all conditions. Only DBP and MAP during the EEOT had a standard deviation of the differences and limits of agreement within ±8 mmHg and ±15 mmHg respectively, and more than 85% of differences within ±10 mmHg. However, as the mean bias for DBP during the EEOT exceeded ±5 mmHg, only MAP during the EEOT met the AAMI/ESH/ISO criteria and can be considered interchangeable with invasive measurement (Table IV).

Table IV: concordance between blood pressures after Bland-Altman analysis and AAMI/ESH/ISO compliance

Condition	Parameter	Bias (mmHg)	SD diff.	Lower LoA	Upper LoA	% within ±10 mmHg
Static	SBP	4.1	15.9	−27.1	35.3	55.3%
Static	DBP	−4.5	8.0	−20.2	11.1	77.1%
Static	MAP	2.0	8.2	−14.1	18.1	72.9%
Passive leg raising	SBP	6.2	12.7	−18.8	31.1	73.8%
Passive leg raising	DBP	−1.4	10.1	−21.2	18.3	61.9%
Passive leg raising	MAP	2.9	8.8	−14.4	20.3	83.3%
Norepinephrine titration	SBP	−1.2	24.0	−48.3	45.9	57.1%
Norepinephrine titration	DBP	−2.7	10.0	−22.3	16.8	73.8%
Norepinephrine titration	MAP	2.6	11.0	−19.1	24.2	73.8%
Fluid challenge	SBP	3.8	16.9	−29.3	37.0	61.9%
Fluid challenge	DBP	−4.8	9.0	−22.4	12.8	69.0%
Fluid challenge	MAP	2.0	12.2	−21.8	25.9	73.8%
End-expiratory occlusion	SBP	−2.5	10.8	−23.6	18.7	73.3%
End-expiratory occlusion	DBP	−5.1	4.5	−14.0	3.8	93.3%
End-expiratory occlusion	MAP	−2.3	6.0	−14.1	9.5	93.3%

Sensitivity Analysis Accounting for Repeated Measures

Given that the 189 measurement pairs were repeated in only 16 patients, we repeated the concordance and correlation analyses using methods appropriate for clustered data (see Patients and Methods). The concordance result was unchanged: oscillometric MAP during the EEOT remained the only combination meeting all three AAMI/ESH/ISO criteria (bias −2.3 mmHg, corrected SD 6.3 mmHg, 86.7% within ±10 mmHg). Correlation, however, was reduced for several combinations once between-patient variance was removed (Table V), notably for MAP during the EEOT, where r fell from 0.92 (p<0.001) to 0.47 (p=0.142; k=5), no longer significant. Two weak naive correlations became significant after correction (norepinephrine titration, SBP and DBP), and one changed direction (fluid challenge, SBP: naive r=0.32 vs

corrected r=−0.77); with only three closely spaced repeated measurements per patient, this most likely reflects a statistically unstable artifact of within-patient centering rather than a genuine inverse relationship. As a precaution, this correlation was not given clinical interpretation.

Table V: Correlation between invasive and oscillometric blood pressure, naive versus corrected analysis for repeated measures (repeated-measures correlation, rmcorr)

Condition	Parameter	k (patients)	Naive r	rmcorr (corrected)	p (corrected)
Static	SBP	16	0.56	0.05	0.770
Static	DBP	16	0.65	0.29	0.104
Static	MAP	16	0.79	0.12	0.521
Passive leg raising	SBP	14	0.54	0.35	0.066
Passive leg raising	DBP	14	0.40	0.31	0.107
Passive leg raising	MAP	14	0.60	0.52	0.004
Norepinephrine titration	SBP	14	0.11	0.48	0.008
Norepinephrine titration	DBP	14	0.24	0.57	0.001
Norepinephrine titration	MAP	14	−0.02	−0.07	0.730
Fluid challenge	SBP	14	0.32	−0.77	<0.001
Fluid challenge	DBP	14	0.69	0.15	0.440
Fluid challenge	MAP	14	0.78	0.74	<0.001
End-expiratory occlusion	SBP	5	0.77	0.70	0.017
End-expiratory occlusion	DBP	5	0.93	0.63	0.040
End-expiratory occlusion	MAP	5	0.92	0.47	0.142

DISCUSSION

This study examined the relationship between oscillometric and invasive blood pressure measurements under static and dynamic conditions in septic patients in a Sub-Saharan African intensive care unit. Overall, oscillometric MAP showed the strongest correlation with invasive values across nearly all conditions and the lowest mean bias overall. In addition, correlation collapsed during norepinephrine titration, where oscillometric measurements tracked invasive values poorly regardless of the situation.

Patient Characteristics

Our patients had a mean age of 53.3 ± 17.1 years and a female predominance (56.3%), in contrast with the findings of Riley *et al*., Tran *et al*., and Kaufmann *et al*., who reported a male predominance [14,15]. Our patients had a mean SOFA score and admission lactate of 9.9 ± 3.2 out of 24 and 3.9 ± 2.8 mmol/L, respectively, reflecting profound hypoperfusion with multiorgan failure and justifying close monitoring. The lungs were the most frequent infectious focus (56.3%), consistent with pneumonia accounting for 40 to 60% of septic shock cases [16], and explaining the frequent need for mechanical ventilation in our patients. All patients received norepinephrine, at a mean dose (1.3 ± 1.8 µg/kg/min) close to that reported by Riley *et al*., (1.5 ± 0.8 µg/kg/min). At such doses, considerable inter-individual variability in oscillometric BP occurs, warranting invasive monitoring as recommended by the Surviving Sepsis Campaign [17].

Comparison and Correlation of Blood Pressure Measurements

Oscillometric measurement was reliable for SBP and, above all, MAP (static condition, fluid challenge), whereas DBP systematically overestimated invasive values (static condition, norepinephrine titration, end-expiratory occlusion test). This likely reflects the greater sensitivity of DBP to vasomotor tone and oscillometric artifacts. Our findings are consistent with the literature, in which MAP — the parameter actually measured by oscillometry — is considered the most stable parameter between the aorta and peripheral arteries, being less influenced by wave amplification and reflection phenomena [18]. This supports its use as a therapeutic target, even in the absence of invasive measurement, in line with Surviving Sepsis Campaign recommendations [17]. The variability observed (particularly for DBP) and the divergent trends seen during certain dynamic tests (norepinephrine titration and the end-expiratory occlusion test) confirm the limitations of oscillometry for guiding resuscitation based on absolute SBP and DBP values, as reported by Lakhal *et al*., [19].

Correlation was generally good under static conditions and strong during the end-expiratory occlusion test (r = 0.6 to 0.8). MAP showed the highest correlation overall. It was modest during the fluid challenge and passive leg raising, particularly for SBP, and nearly absent and non-significant during norepinephrine titration.

This calls into question the reliability of oscillometry in this context, consistent with Guinot et al.'s finding of poor correlation during norepinephrine administration. Our SBP correlation under static conditions was more modest than that of Lakhal *et al*., whereas our DBP correlation was comparatively better, which may reflect differences in the study populations [19, 20]. Overall, oscillometric measurements may be

considered an alternative under static conditions and during the end-expiratory occlusion test, but they are not suited to rapid hemodynamic changes (vasopressor titration, passive leg raising).

Concordance between Blood Pressures

Bland-Altman analysis of concordance between oscillometric and invasive BP across conditions showed an overall mean bias ≤ ±5 mmHg, except for SBP during passive leg raising and DBP during the end-expiratory occlusion test. Across all conditions, the mean bias for MAP remained < ±3 mmHg. These findings indicate that, overall, oscillometric measurements remain close to invasive values, particularly for MAP, reinforcing its reliability. Per the 2018 AAMI/ISO/ESH recommendations, our mean biases were compliant, especially for MAP [10]. However, all oscillometric DBP values systematically overestimated invasive measurements, reflecting the significant discordance observed on Student's t-test, even though correlation analysis showed them to be correlated with invasive values. The underestimation of SBP and MAP and the overestimation of DBP by oscillometry differed from the results of Riley *et al*., (2017) [14].

Regarding precision (standard deviations of the differences), limits of agreement exceeded the 2018 AAMI/ISO/ESH thresholds of ±8 and ±15 mmHg, except for DBP and MAP during the end-expiratory occlusion test. This wide dispersion was especially marked at low BP values (MAP ≤ 60 and DBP ≤ 40 mmHg). Only oscillometric MAP during this test was concordant with invasive values per the 2018 AAMI/ISO/ESH standards. The non-interchangeability of the two methods under most conditions is consistent with the work of Riley *et al*., (2017), Kaufmann *et al*., (2020), Tran *et al*., (2022), and Jiang *et al*., (2024) [14-22]. These findings reinforce the Surviving Sepsis Campaign recommendations to establish invasive BP monitoring as early as possible, targeting MAP in septic shock [17].

Limitations

Our study had several limitations. First, it involved a small cohort of patients in septic shock, and other causes of shock warrant future evaluation. Second, it was single-center, with a limited recruitment period. Third, the distribution of paired measurements was heterogeneous across conditions. Fourth, the 189 measurement pairs were not independent, being clustered within a small cohort of 16 patients. The dedicated sensitivity analysis confirmed the stability of the concordance finding, although attenuated correlations were observed after accounting for between-patient variance (notably for MAP during the occlusion test: r=0.47, p=0.142, k=5). These findings reflect a lack of statistical power rather than a refutation of the signal. Confirmation in a larger, multicenter sample therefore appears necessary.

Decision Algorithm for the Use of Non-Invasive Blood Pressure in the Absence of Invasive Monitoring

Based on our findings, we propose a practical decision algorithm to guide the use of oscillometric BP monitoring in septic patients when arterial catheter placement is not immediately possible — a common situation in resource-limited settings (Figure 1). Given the limitations of the study, this algorithm constitutes a pragmatic proposal intended for resource-limited settings, which requires prospective external validation in a larger cohort before routine use.

Color Code: blue = action; orange = decision point; green = reassuring; red = caution/expedite arterial line; amber = safety reminder.

Septic patient / septic shock requiring hemodynamic blood pressure monitoring	
↓	↓
Is an arterial line in place, or immediately feasible?	
NO ↓	**YES ↓**
↓	Use INVASIVE arterial BP (reference). Target MAP per the Surviving Sepsis Campaign. Reassess regularly; oscillometric NIBP is not required for primary titration.
Use OSCILLOMETRIC MAP — not SBP or DBP — as the interim target. Check cuff size; place it on the arm contralateral to any planned catheter site.	
↓	↓
Is rapid vasopressor titration in progress (e.g., norepinephrine)?	
YES ↓	**NO ↓**
Do NOT rely on the oscillometric trend (r ≈ 0, not significant). Titrate cautiously; increase measurement frequency; add perfusion markers (lactate clearance, capillary refill time, urine output). Expedite arterial line placement.	Adapt confidence to context: • End-expiratory occlusion test (deep sedation, no ventilator triggering): fully meets AAMI/ESH/ISO criteria (bias −2.3 mmHg, 93.3% within ±10 mmHg) — the single most reliable reading. • Static / passive leg raising / fluid challenge: correlated (r=0.61–0.79) but NOT interchangeable (limits of

	agreement up to ±25 mmHg) — follow the TREND, corroborate with clinical/perfusion markers.
↓	↓
Is oscillometric MAP ≤ 65 mmHg, or in the low range (MAP ≤ 60 / DBP ≤ 40 mmHg)?	
YES ↓	**NO ↓**
Treat the reading as an ALERT, not a precise value: remeasure more frequently, check cuff fit and site, and expedite arterial catheter placement.	Continue oscillometric MAP monitoring; reassess regularly and place an arterial line as soon as resources allow.
↓	↓
At every step: significant arrhythmia, severe vasoconstriction, marked edema, or morbid obesity → expedite arterial catheter placement regardless of the above.	

Figure 1: Proposed decision algorithm for the use of oscillometric non-invasive blood pressure (NIBP) in septic patients when invasive arterial monitoring is unavailable or delayed

CONCLUSION

In septic patients, oscillometric blood pressure correlated with invasive measurements under most conditions, most consistently for MAP, but the two methods were fully interchangeable only for MAP during the end-expiratory occlusion test, and correlation was lost during norepinephrine titration. A sensitivity analysis accounting for repeated measures confirmed this central concordance finding, although patient-level correlation for this best-performing combination is not yet statistically confirmed at this sample size. In the absence of invasive monitoring, oscillometric MAP — rather than SBP or DBP — can reasonably support clinical decision-making under stable or static conditions, provided its limitations are recognized, particularly during rapid vasopressor adjustment and at low pressure values. However, arterial catheter placement remains imperative as soon as resources allow. Larger, multicenter studies, adequately powered for repeated-measures analysis, are needed to validate the proposed decision algorithm before broader clinical adoption, particularly in resource-limited settings.

Author Contributions

Metogo Mbengono J.A.: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft, Writing – review & editing.
Passi Sonne: Methodology, Investigation, Formal analysis, Data curation, Writing – original draft.
Bengono Bengono R.: Methodology, Formal analysis, Writing – review & editing.
Malangue Ebokolo B.: Investigation, Data curation, Writing – review & editing.
Ze Minkande J.: Conceptualization, Supervision, Writing – review & editing.
All authors read and approved the final manuscript.

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Ethics Statement

This study was approved by the administration of Douala General Hospital, and informed consent was obtained from all participants or their legal representatives. Reference number N°0189 was issued by the Institutional Ethics Review Committee of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I.

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