

Obstetric ICU Admissions and In-Hospital Maternal Outcomes at a Specialized Women's Hospital in Uganda

Dr. Elizabeth Nionzima¹, Dr. Henry Kiiza², Ms. Elizabeth Orodriyo³

¹MFM Specialist, Aternal-Fetal Medicine, MSWNH

²Obstetrician/Gynecologist, Maternal-Fetal Medicine, MSWNH

³Midwife, Maternal-Fetal Medicine, MSWNH

Abstract

Background: Obstetric intensive care provides essential organ support for women with severe pregnancy-related complications. Reviewing ICU admissions can identify patterns of morbidity, treatment and in-hospital maternal outcomes.

Objective: To describe obstetric conditions, interventions and in-hospital outcomes among ICU admissions over four years, and to explore factors associated with recorded in-hospital death.

Methods: We reviewed 261 obstetric ICU admission records at Mulago Specialized Women and Neonatal Hospital from 1 July 2019 to 30 June 2023. Crude odds ratios (ORs) and 95% confidence intervals (CIs) were calculated from available exposure and outcome data. An exploratory logistic model included 11 specified covariates and 241 complete records.

Results: Mean age was 28.6 ± 6.6 years among 252 admission records, and 224/261 (85.8%) were referrals. Severe pre-eclampsia (55, 21.1%), severe postpartum hemorrhage (50, 19.2%) and sepsis or severe systemic infection (43, 16.5%) were frequently recorded obstetric syndromes. Among 253 admissions with a documented outcome, 102 (40.3%) recorded in-hospital death. In the complete-record model, ventilation or intubation ≥ 60 minutes (AOR 10.95, 95% CI 5.09-23.58), shock (6.76, 2.66-17.21) and sepsis or severe systemic infection (3.42, 1.29-9.06) were associated with higher odds of death. Transfusion ≥ 5 units was associated with lower odds (0.31, 0.10–0.97).

Conclusion: In-hospital mortality was high among obstetric ICU admissions with documented outcomes. Shock, prolonged ventilation and sepsis or severe infection were associated with higher odds of death; treatment associations cannot establish benefit or harm. The findings support focused audit of recognition, resuscitation and referral processes, with validation of episode identity and coding before service-wide inference.

Keywords: Obstetric Critical Care; In-Hospital Mortality; Maternal Morbidity; Intensive Care; Postpartum Hemorrhage; Sepsis; Uganda

Introduction

Maternal deaths continue to reflect gaps in timely access to effective obstetric care. WHO and partner estimates describe a persistent global burden through 2023 [1]. Facility-level reviews complement

population surveillance by identifying the conditions and care processes surrounding severe maternal outcomes.

In Uganda, prospective studies have linked organ dysfunction and critical interventions with severe maternal outcomes. Circulatory collapse and intubation unrelated to anesthesia are important markers of deterioration [2]. Hypertensive disorders, hemorrhage and infection contribute substantially to the severe obstetric case mix [2, 3].

The WHO maternal near-miss approach provides a conceptual framework linking obstetric complications, organ dysfunction, critical interventions and survival or death [4]. ICU admission is influenced by both clinical need and access to beds and staff, which affects the case mix of an ICU cohort. This framework guides interpretation here; the study does not establish that every survivor met WHO near-miss criteria. This review describes four years of obstetric ICU admissions at a specialized women's hospital in Kampala. Its contribution is a local profile of case mix, resource use and in-hospital outcomes to inform audit and service planning, rather than a population incidence estimate or a validated mortality prediction tool.

Methods

Study design and setting

We conducted a retrospective records review of obstetric ICU admissions at Mulago Specialized Women and Neonatal Hospital, Kampala, Uganda, a national referral facility providing specialist obstetric, maternal-fetal medicine, anaesthesia, neonatal and intensive care services. Exposure and treatment timing were not sufficiently defined to support causal or time-to-event analysis.

Study population and eligibility

All 261 available obstetric ICU admission records from 1 July 2019 to 30 June 2023 were included.

Data collection and variables

Data were abstracted from hospital registers and clinical records using a standardized form. Variables included age, referral and antenatal booking status, pregnancy status, complications, organ-dysfunction indicators, interventions and recorded in-hospital death. The ICU admission date was available for all 261 admission records and was used for the six-month admission profile. Only aggregate findings are reported.

Definitions

Variables were analyzed according to their recorded coding. Severe pre-eclampsia and eclampsia used the severe-complication fields; they were not re-adjudicated using clinical observations. Contemporary diagnostic guidance provides clinical context [5]. The infection exposure was labelled “sepsis or severe systemic infections”; it cannot be assumed to meet the WHO definition of infection-associated organ dysfunction in every record [6]. Shock used the cardiovascular shock field, whose label specifies persistent severe hypotension despite resuscitation. Ventilation or intubation meant ≥ 60 minutes for reasons other than general anesthesia. Transfusion meant ≥ 5 units of blood, not any transfusion. The outcome was the field “died in hospital” (yes/no); ICU-only death and post-discharge mortality were not the primary outcomes.

Statistical analysis

Frequencies and percentages describe all 261 obstetric ICU admission records; documented age is summarized by mean and standard deviation. Six-month counts describe admission volume, not incidence rates. Blank values and codes other than yes/no were treated as missing for binary exposure analyses. The 253 admissions with a documented in-hospital outcome formed the available-outcome population. Table 3 reports crude ORs for death, log-Wald 95% CIs and two-sided Pearson chi-square p-values without continuity correction; each comparison uses its own complete exposure–outcome records.

The exploratory model included all 11 covariates shown in Table 4 simultaneously: age ≥ 35 years, referral, booking at this hospital, severe pre-eclampsia, eclampsia, severe postpartum hemorrhage, sepsis or severe systemic infection, shock, prolonged ventilation or intubation, transfusion ≥ 5 units and dialysis. Each binary exposure compared yes with no; age compared ≥ 35 with < 35 years. The 241 complete records excluded eight missing outcomes and a further 12 records with missing model covariates. Adjusted ORs, log-Wald 95% CIs and Wald p-values were calculated in Python using statsmodels 0.15.0. The model converged; covariate variance inflation factors ranged from 1.10 to 2.12. This was a reconstructed exploratory model, not a prospectively specified or validated prediction model.

No imputation was applied. Unadjusted p-values are descriptive across multiple comparisons. ORs measure odds rather than risk ratios, particularly when mortality is common. Reporting was guided by the STROBE checklist [9].

Ethical considerations

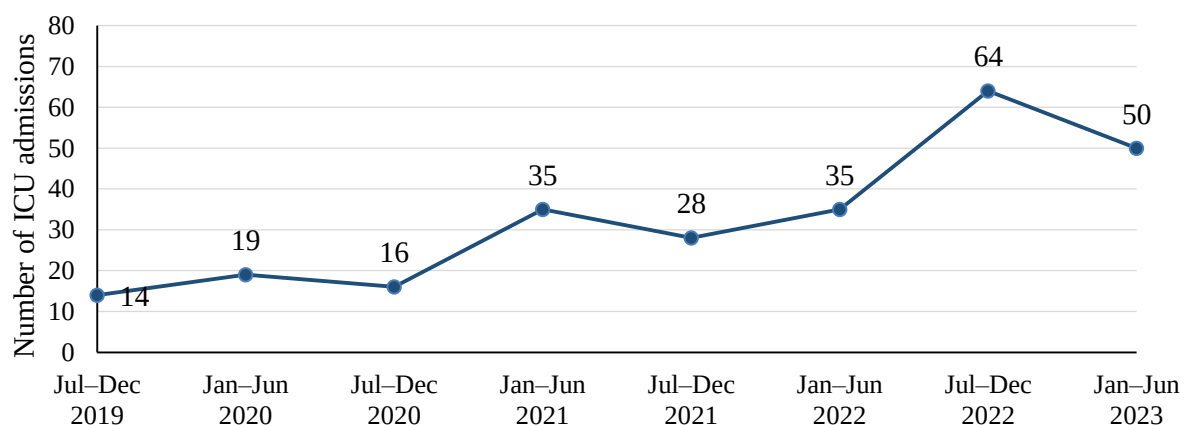
Hospital administrative permission for the retrospective review was reported. [Insert the verified research ethics committee determination, approval or exemption reference, date, and consent or waiver requirements.] Administrative permission should be reported separately from the committee determination. Identifiers were excluded from analytical outputs.

Results

ICU admissions and six-month profile

The study included 261 obstetric ICU admission records. In-hospital outcomes were available for 253 admissions; 241 records were complete for all covariates in the adjusted model. Six-month admission counts ranged from 14 in July–December 2019 to 64 in July–December 2022, followed by 50 in January–June 2023 (Figure 1).

Figure 1 Six-month distribution of obstetric ICU admissions



Maternal and obstetric characteristics

Age was available for 252 records (mean 28.6 ± 6.6 years; range 14–48). Referral was recorded for 224/261 (85.8%), and 22/261 (8.4%) were booked for antenatal care at this hospital. Pregnancy at hospital admission was coded yes for 113 (43.3%) and no for 148 (56.7%) as postpartum (Table 1).

Table 1 Maternal characteristics among 261 obstetric ICU admissions

Characteristic	n or value	% of 261
Age, mean $\pm$ SD, years	28.6 ± 6.6	—
Age <20 years	23	8.8
Age 20–24 years	50	19.2
Age 25–29 years	65	24.9
Age 30–34 years	58	22.2
Age 35–39 years	42	16.1
Age $\geq$ 40 years	14	5.4
Age missing	9	3.4
Referred from another facility	224	85.8
Booked at study hospital	22	8.4
Pregnant at hospital admission	113	43.3
Postpartum at hospital admission	148	56.7

Recorded complications and interventions

Frequently recorded major obstetric syndromes included severe pre-eclampsia, severe postpartum hemorrhage and sepsis or severe systemic infection. Anemia was separately coded in 103 records. Recorded complications describe coexisting conditions and do not identify a single primary reason for ICU admission. Antibiotics and free-flow intravenous fluids were common recorded treatments; ventilation or intubation $\geq$ 60 minutes was coded in 100 (38.3%), and transfusion $\geq$ 5 units in 59 (22.6%) (Table 2).

Table 2: Recorded complications and interventions among 261 obstetric ICU admissions

Recorded condition	n (%)	Recorded intervention	n (%)
Severe pre-eclampsia	55 (21.1)	Antibiotics	150 (57.5)
Severe postpartum hemorrhage	50 (19.2)	Free-flow IV fluids	133 (51.0)
Sepsis or severe systemic infection	43 (16.5)	Caesarean section	106 (40.6)

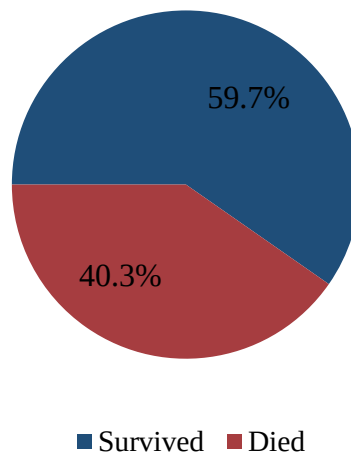
Recorded condition	n (%)	Recorded intervention	n (%)
Septic shock	35 (13.4)	Ventilation or intubation ≥ 60 min	100 (38.3)
Eclampsia	24 (9.2)	Anticonvulsants or magnesium sulphate	64 (24.5)
Severe abortion complications	16 (6.1)	Transfusion ≥ 5 units	59 (22.6)
Anemia	103 (39.5)	Continuous vasoactive drugs	46 (17.6)
Pulmonary embolism	14 (5.4)	Dialysis for acute renal failure	15 (5.7)
Anesthetic accident	20 (7.7)	—	—
Uterine rupture	10 (3.8)	—	—

Notes: Conditions and interventions overlap; percentages use all 261 records and do not sum to 100%. These are coded conditions, not adjudicated primary indications. Missing/other codes: anemia 3, septic shock 2, pulmonary embolism 3, anticonvulsants 2, caesarean section 1 and dialysis 1. Intubation excludes general anesthesia; transfusion is ≥ 5 units.

Maternal outcomes

Among 253 ICU admission records with a documented in-hospital outcome, 151 (59.7%) recorded survival and 102 (40.3%) recorded death; eight outcomes were missing (Figure 2). The outcome covers the hospital stay and does not establish whether death occurred within ICU. Across all 261 admissions, the death proportion would range from 39.1% to 42.1% if all eight missing outcomes were survival or death, respectively.

Figure 2: In-hospital outcomes among 253 obstetric ICU admissions with an outcome



Factors associated with maternal mortality

Available-record bivariate associations are shown in Table 3. Sepsis or severe systemic infection, septic shock, shock, prolonged ventilation or intubation, intravenous fluids and antibiotics were associated with

higher odds of recorded death. Age ≥ 35 years, booking at this hospital and transfusion ≥ 5 units were associated with lower odds. These are unadjusted associations among these obstetric ICU admissions.

Table 3 Selected crude associations with recorded in-hospital death

Comparison	Survived n (%)	Died n (%)	n	Crude OR	95% CI	p-value
Age ≥ 35 vs < 35 years	40 (74.1)	14 (25.9)	246	0.45	0.23–0.88	0.018
Booked vs not booked at study hospital	18 (81.8)	4 (18.2)	252	0.30	0.10–0.91	0.026
Sepsis or severe infection vs none	14 (33.3)	28 (66.7)	253	3.70	1.84–7.46	< 0.001
Septic shock vs none	9 (27.3)	24 (72.7)	251	4.88	2.16–11.03	< 0.001
Shock vs none	12 (23.5)	39 (76.5)	250	7.02	3.44–14.31	< 0.001
Ventilation or intubation ≥ 60 min vs none	31 (31.6)	67 (68.4)	253	7.41	4.20–13.08	< 0.001
Transfusion ≥ 5 units vs no ≥ 5 -unit transfusion	42 (75.0)	14 (25.0)	253	0.41	0.21–0.80	0.008
IV fluids vs none	51 (39.2)	79 (60.8)	253	6.73	3.79–11.96	< 0.001
Antibiotics vs none	70 (48.3)	75 (51.7)	253	3.21	1.87–5.54	< 0.001

Notes: OR = odds ratio; CI = confidence interval; IV = intravenous. Survived and died counts describe the first category in each comparison, with percentages within that category; ORs compare it with the second category. The reference category has OR 1.00. Eight outcomes were missing; additional exposure missing accounts for analysis n below 253. CIs use the log-Wald method and p-values use Pearson chi-square tests. Ventilation or intubation excludes general anesthesia. “No ≥ 5 -unit transfusion” may include transfusion of fewer than five units. Treatment codes describe recorded use, not verified treatment timing. The exploratory adjusted analysis included 241 complete records, comprising 98 deaths and 143 survivals. Higher odds of recorded death were associated with prolonged ventilation or intubation (AOR 10.95, 95% CI 5.09–23.58), shock (6.76, 2.66–17.21) and sepsis or severe systemic infection (3.42, 1.29–9.06). Age ≥ 35 years (0.40, 0.16–0.99), eclampsia (0.12, 0.02–0.78) and transfusion ≥ 5 units (0.31, 0.10–0.97) were associated with lower adjusted odds. These results are conditional associations, not evidence of causal protection or a validated prediction model (Table 4; Figure 3).

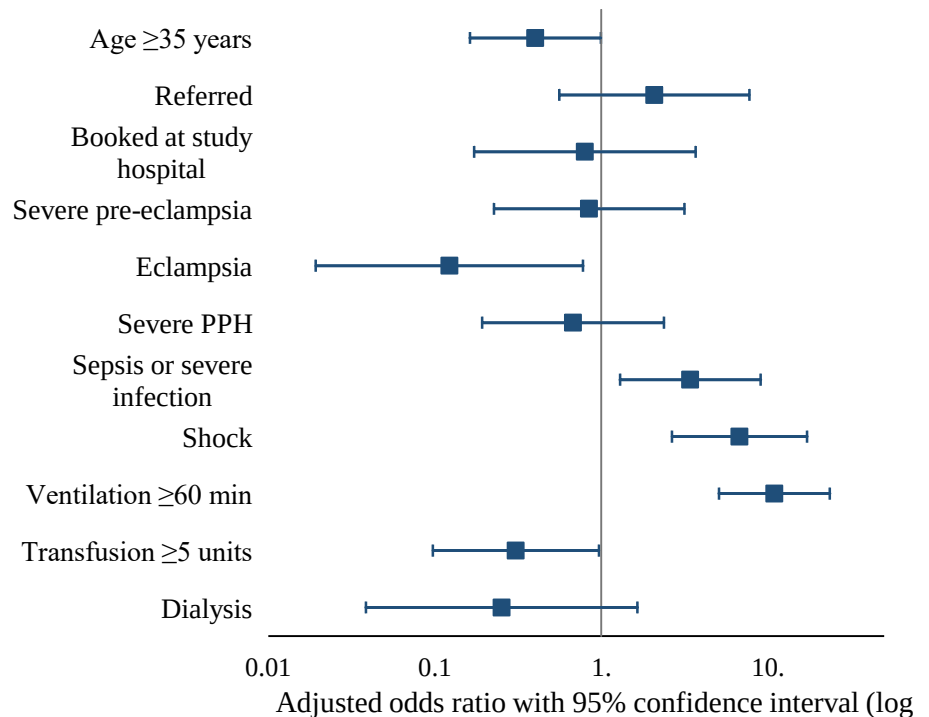
Table 4: Exploratory adjusted associations with recorded in-hospital death

Variable	AOR	95% CI	Wald p-value
Age ≥ 35 years	0.40	0.16–0.99	0.048
Referred from another facility	2.08	0.56–7.75	0.273

Variable	AOR	95% CI	Wald p-value
Booked at study hospital	0.80	0.17-3.68	0.771
Severe pre-eclampsia	0.85	0.23-3.15	0.803
Eclampsia	0.12	0.02-0.78	0.026
Severe postpartum hemorrhage	0.68	0.19-2.38	0.542
Sepsis or severe systemic infection	3.42	1.29-9.06	0.013
Shock	6.76	2.66-17.21	<0.001
Ventilation or intubation ≥ 60 min	10.95	5.09-23.58	<0.001
Transfusion ≥ 5 units	0.31	0.10-0.97	0.044
Dialysis for acute renal failure	0.25	0.04-1.65	0.150

Notes: All 11 covariates entered together; n=241, including 98 deaths.

Figure 3: Adjusted odds ratios and 95% confidence intervals in 241 complete records



Discussion

This four-year review describes a referral-dominated obstetric ICU population, frequent critical interventions and high in-hospital mortality among admissions with documented outcomes. Shock, prolonged ventilation or intubation, and sepsis or severe systemic infection were associated with higher

adjusted odds of death. These associations describe the selected ICU cohort and do not establish treatment effects or comparative ICU performance.

Higher six-month admission counts towards the end of the review may reflect changes in referral volume, documentation, case ascertainment or access to care. Without delivery denominators, total hospital admissions and ICU occupancy, the counts cannot establish rising disease incidence or unmet ICU demand. Prospective capture of those denominators would make the service profile more useful.

Severe pre-eclampsia, severe postpartum hemorrhage and infection were prominent recorded obstetric syndromes, consistent with Ugandan studies of severe maternal morbidity [2, 3]. They provide practical targets for case review, but overlapping coded conditions should not be ranked as mutually exclusive causes of death. Current clinical guidance supports timely management of severe hypertension and eclampsia [5] and coordinated hemorrhage detection and treatment [7]. These external recommendations should not be interpreted as interventions evaluated by this review.

The combined sepsis or severe-infection field was associated with death in the adjusted model. The exposure combines clinically heterogeneous diagnoses, and unmeasured severity may influence the estimate. The finding supports closer review of infection coding and clinical trajectories. SMFM recommends rapid assessment, antimicrobials, source control and resuscitation for maternal sepsis [8].

Ventilation and shock may represent advanced organ dysfunction occurring after initial deterioration. Their associations are compatible with the WHO near-miss framework and Ugandan observations [2, 4]. Confounding by illness severity, treatment indication and uncertain exposure timing prevent causal interpretation: the analysis does not show that ventilation, fluids or antibiotics increase mortality. Comparing OR magnitude also does not establish comparative predictive accuracy.

The transfusion exposure represents ≥ 5 units, a management-based severity marker, rather than routine blood replacement. It was associated with lower adjusted odds of death. Treatment selection, access to blood, survival long enough to receive treatment, and unmeasured hemorrhage severity may explain part of the association. The review cannot establish a protective effect, optimal dose or timing; reliable blood access remains a clinical priority supported by hemorrhage guidance [7].

The lower adjusted odds for age ≥ 35 and eclampsia should be interpreted cautiously. Eclampsia occurred in 24 admission records, with only five documented deaths; its estimate was based on sparse data and may be unstable. Adjustment for organ support and shock, diagnostic overlap and referral selection may influence these estimates. Eclampsia remains a serious obstetric emergency; this result must not be used to reduce vigilance. The cohort's 40.3% in-hospital mortality is not directly comparable with population mortality ratios or other critical-care cohorts without compatible selection and severity criteria.

Strengths and limitations

Strengths include four years of obstetric ICU admission records, verified record-level crude estimates and reconstruction of an adjusted model with defined coding. Limitations include a single-centre retrospective design, incomplete characterization of case capture, missing data, overlapping diagnoses and uncertain timing of interventions. Two repeated identifiers, including one same-date pair, require episode validation; treating records as independent may affect uncertainty estimates. Some hospital admission and discharge/death dates were outside the stated period and were not used for longitudinal inference. The model contains 11 covariates for 98 deaths, has no external validation and may be unstable for sparse exposures. Complete-record selection and unmeasured severity confounding limit generalizability and causal interpretation.

Conclusion

Among 261 obstetric ICU admission records, in-hospital mortality was 40.3% in the 253 admissions with known outcomes. Shock, prolonged ventilation or intubation, and sepsis or severe systemic infection were associated with higher adjusted odds of death. Lower odds associated with transfusion, age ≥ 35 and eclampsia require cautious interpretation because of treatment selection, sparse data and unmeasured severity. The findings support focused clinical audit; episode validation, standardized coding and service denominators are needed before broader prognostic or performance claims.

Recommendations

Clinical audit should prioritize the course of shock, infection and respiratory deterioration, including recognition, escalation, resuscitation and transfer. Prospective improvement work should record time to review, antimicrobial delivery, blood availability and organ support, alongside case mix and outcome. Registry improvements should validate admission and outcome dates, distinguish unique women from repeated admissions, document case capture and the missing, and standardize diagnoses. Multicentre studies with reliable denominators, measured severity and prospective timing should evaluate intervention effectiveness and longer-term maternal and neonatal outcomes.

Acknowledgements:

The authors acknowledge the leadership and staff of Mulago Specialized Women and Neonatal Hospital, particularly the Obstetrics, Maternal-Fetal Medicine, Anesthesia, Intensive Care, Health Records and Research teams.

References

1. World Health Organization, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division. Trends in maternal mortality 2000 to 2023. Geneva: WHO; 2025. <https://www.who.int/publications/i/item/9789240108462>
2. Nakimuli A, Nakubulwa S, Kakaire O, Osinde MO, Mbalinda SN, Nabirye RC, et al. Maternal near misses from two referral hospitals in Uganda: a prospective cohort study on incidence, determinants and prognostic factors. BMC Pregnancy Childbirth. 2016;16:24. doi:10.1186/s12884-016-0811-5.
3. Nakimuli A, Nakubulwa S, Kakaire O, Osinde MO, Mbalinda SN, Kakande N, et al. The burden of maternal morbidity and mortality attributable to hypertensive disorders in pregnancy: a prospective cohort study from Uganda. BMC Pregnancy Childbirth. 2016;16:205. doi:10.1186/s12884-016-1001-1.
4. World Health Organization. Evaluating the quality of care for severe pregnancy complications: the WHO near-miss approach for maternal health. Geneva: WHO; 2011. <https://www.who.int/publications/i/item/9789241502221>
5. American College of Obstetricians and Gynecologists. Gestational hypertension and preeclampsia: ACOG Practice Bulletin, Number 222. Obstet Gynecol. 2020;135(6):e237–e260. doi:10.1097/AOG.0000000000003891.
6. World Health Organization. Statement on maternal sepsis. WHO/RHR/17.02. Geneva: WHO; 2017. <https://www.who.int/publications/i/item/WHO-RHR-17.02>

7. World Health Organization, FIGO and ICM. Consolidated guidelines for the prevention, diagnosis and treatment of postpartum haemorrhage. Geneva: WHO; 2025. <https://www.who.int/publications/i/item/9789240115637>
8. Society for Maternal-Fetal Medicine, Shields AD, Plante LA, Pacheco LD, Louis JM, SMFM Publications Committee. Society for Maternal-Fetal Medicine Consult Series #67: Maternal sepsis. *Am J Obstet Gynecol*. 2023;229(3):B2–B19. doi:10.1016/j.ajog.2023.05.019. Reaffirmed 2025.
9. STROBE Initiative. STROBE checklists for observational studies. <https://www.strobe-statement.org/checklists/> (accessed 11 October 2026).