

Full Title	The African Critical Illness Outcomes Study
Short Title	ACIOS
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Funder	National Institute for Healthcare and Care Research (NIHR) through the Global Health Group on Perioperative and Critical Care: “APPRISE”
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Data management	Safe Surgery South Africa

1. Signature page

CI Agreement

The study, as detailed within this Research Protocol, will be conducted in accordance with the principles of GCP, and the Declaration of Helsinki (64th WMA General Assembly, Fortaleza, Brazil, October 2013) and any other applicable regulations. I delegate responsibility for the statistical analysis and oversight to a qualified statistician (see declaration below).

CI name: Tim Baker

Signature:



Date: 17 April 2023

Statistician's Agreement

The study as detailed within this research protocol will be conducted in accordance with the World Medical Association Declaration of Helsinki (64th WMA General Assembly, Fortaleza, Brazil, October 2013), Principles of ICH E6-GCP, ICH E9 - Statistical principles for Clinical Trials and ICH E10 - Choice of Control Groups.

I take responsibility for the statistical work in this protocol is accurate and take responsibility for statistical analysis and oversight in this study.

Statistician's name: Anneli Hardy

Signature:



Date: 17 April 2023

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2. List of abbreviations

ACCCOS	African COVID-19 Critical Care Outcomes Study
ACIOS	African Critical Illness Outcomes Study
APORG	(African Perioperative Research Group)
APPRISE	African Partnership on Perioperative and Critical Care Research
ASOS	African Surgical Outcomes Study
ASOS-2	African Surgical OutcomeS-2 (ASOS-2) trial
CRISPOS	Critical Illness and Sepsis Prevalence and Outcomes Study
EECC	Essential Emergency and Critical Care
EuSOS	European Surgical Outcomes Study
HDU	High Dependency Unit
ICU	Intensive Care Unit
ISOS	International Surgical Outcomes Study
NIHR	National Institute for Health and Care Research
SAP	Statistical Analysis Plan

3. Summary

Short title	ACIOS
Methodology	A prospective, international, multi-centre, observational study.
Research sites	Acute hospitals in African countries.
Objective	To determine the hospital point-prevalence and mortality rates of adult patients with critical illness in hospitals in Africa.
Number of patients	Not specified. All eligible patients in participating hospitals.
Inclusion criteria	All in-hospital patients aged 18 years or older in all departments and wards in participating hospitals in Africa.
Exclusion criteria	None
Patient follow-up	Until hospital discharge or death, censored at 7 days after inclusion.
Primary outcomes	1. The presence of critical illness 2. 7-day in-hospital mortality
Statistical analysis	Descriptive statistics, univariate and multivariable logistic regression models. A statistical analysis plan will be written before analysis.
Data collection duration	One day in each hospital in September-November 2023 plus 7 days follow-up in each hospital
Proposed start date	1 st September 2023
Proposed end date	7 th December 2023

4. Introduction

Critically ill patients – those in *a state of ill health with vital organ dysfunction, a high risk of imminent death if care is not provided, and the potential for reversibility*.¹ – have particular needs, and managing these needs is a core function of hospitals. Triage at admission and on the wards is needed to identify these patients with critical illness.^{2,3} Critically ill patients need regular contact with health workers and close observation and frequent modifications to care, either in general wards, or in specialised locations such as Intensive Care Units (ICUs) and High Dependency Units (HDUs).⁴ Rapid Response Teams of acute care specialists may be implemented in hospitals to provide care when called by ward staff.⁵

There are reports of gaps in the readiness and provision of critical care in hospitals in Africa.⁶⁻⁸ Essential Emergency and Critical Care (EECC) has been developed and defined as the first-line care that should be provided to all critically ill patients.^{9,10} Focusing on the first-line care in EECC is a strategy to address the gap in critical care. In our previous work an unmet need of EECC of 50-90% was found in hospitals in Malawi,⁸ and there have been many calls to increase the coverage of EECC to address this gap.^{9,11-13}

While it is accepted that critical illness and the underlying causes of critical illness are common, the number of patients with critical illness has not been accurately quantified.¹⁴⁻¹⁶ In one region of Sweden we found 10% of hospital inpatients to be critically ill,¹⁷ and in a Tanzanian university hospital's emergency unit, 10% of patients were critically ill at arrival.¹⁸ Global estimates have been attempted by using the admission rates to ICUs but this method reflects national and local uses of ICUs which vary greatly even between high-income countries.¹⁹ The indirect annual global estimate of 30-45 million adults made by extrapolating the incidence of common diseases leading to critical illness in North America is likely to be an underestimate as the burden of disease is greater in settings of lower resources.²⁰ Moreover, the mortality of critically ill patients has not been accurately quantified, with reports of 18-82% in-hospital mortality rates.²¹⁻²⁵

A patient's vital signs (heart rate, respiratory rate, blood pressure, conscious level, body temperature, oxygen saturation) are commonly used measurements in hospital care. Deranged vital signs have been shown to correlate with negative outcomes such as admission to the ICU,^{26,27} unexpected cardiac arrest,^{27,28} and mortality,^{27,29} and are pragmatic and useful as criteria for the identification of critical illness.^{30,31}

We will conduct a prospective, international, multi-centre, observational study of all adult in-patients in hospitals across Africa, based on the methods we developed in the International Surgical Outcomes Study (ISOS),³² European Surgical Outcomes Study (EuSOS),³³ African Surgical Outcomes Study (ASOS),³⁴ and African COVID-19 Critical Care Outcomes Study (ACCCOS)²² studies. Using vital-signs based criteria, we will determine the hospital point-prevalence of critical illness. We will collect data on the care provided to patients, so to determine the coverage of essential emergency and critical care. We will follow the adult in-hospital patients for 7 days or until hospital discharge (whichever is sooner), allowing an estimate of the mortality rate and patients at increased risk who are critically ill in this population. The knowledge generated in the ACIOS study will assist in improving organisation of acute hospital services with the goal of averting substantial numbers of preventable deaths in African hospitals.

5. Aim, Objectives, Research questions and Outcomes

5.1 Aim

To investigate critical illness, its care and associated outcomes among all adult inpatients in hospitals across Africa.

5.2 Objectives

1. To establish the proportion of adult (18 years or older) inpatients in African hospitals that are critically ill.
2. To establish the mortality rate of the critically ill patients and those who are not critically ill.
3. To estimate the proportion of critically ill patients who receive essential emergency and critical care.
4. To investigate the association between the provision of essential emergency and critical care to critically ill patients and mortality.
5. To determine the availability of resources for essential emergency and critical in African hospitals.

5.3 Research questions

Among adult (18 years or older) inpatients in African hospitals:

1. What proportion of patients are critically ill?
2. What are the mortality rates for patients who are, and who are not critically ill?
3. What proportion of critically ill patients receive essential emergency and critical care?
4. What is the relationship between essential emergency and critical care provision, and mortality?

In African hospitals:

5. What is the availability of resources for the provision of essential emergency and critical care?

5.4 Co-primary outcomes

- Presence of critical illness
- In-hospital mortality (censored at 7-days)

5.5 Secondary outcomes

- Provision of essential emergency and critical care
- Length of hospital stay

5.6 Hospital level outcome

- Availability of resources for essential emergency and critical care

6. Methods

6.1 Study design

African, multi-centre prospective observational cohort study of in-hospital adult patients.

6.2 Study setting

Hospitals across Africa.

6.3 Hospital participation criteria

Any acute hospital in Africa providing adult inpatient care (see Definitions section 8).

6.4 Study population (patient Inclusion criteria)

All adult patients aged 18 years or over who have been admitted for inpatient care in any department or ward in participating hospitals.

6.5 Exclusion criteria

None.

7. Study Procedures

7.1 Hospital Recruitment

Hospitals will be recruited through the African Perioperative Research Group (APORG) network, the Essential Emergency and Critical Care (EECC) network and other networks in Africa.

7.2 Study data

Data will be collected on all eligible patients on the study day and then during in-hospital follow-up.

7.3 Data collection

A pragmatic and realistic dataset is fundamental to the success of the study. Data will be collected on paper on one-day in each hospital plus follow-up censored at 7 days. Data will be collected:

- At hospital level for the availability of resources for EECC.
- At the patient's bedside for patient demographic and medical information, physiological signs, and ongoing provision of EECC and
- From hospital records for patient outcomes.

7.3.1 Schedule of assessment

Event/ Visit	Study day	Until discharge or death, censored at 7 days
Hospital level data	X	
Inclusion/ exclusion criteria	X	
Demographic information	X	
Medical information	X	
Physiological signs	X	
EECC provision	X	
Outcomes		X

7.3.2 Hospital level data collection

Data will be collected once for each hospital to assess the availability of resources for the provision of EECC. A checklist of resources will be used and data entered together with a key informant in the hospital. The key informant may be the medical-officer-in-charge or other clinician or administrator

who has an in-depth knowledge of the resources available in the hospital for managing critically ill patients, as identified by the study team's local coordinator. In addition, data will be collected on:

- Population served (catchment area)
- Primary, secondary or tertiary hospital
- Number of hospital beds
- Number and level of critical care beds
- Details about the reimbursement status of the hospital
- Resources in the hospital such as staff and equipment

7.3.3 Patient level data collection

On the specified day of data collection, every patient fulfilling the inclusion criteria in every department and ward in the hospital will be included in the study. Patients who are absent from their beds when the study team arrive, (for example, are in an operating theatre, or undergoing a medical investigation), will be re-visited later the same day and included when they are back in their bed, or when they are in a bed where inclusion is possible such as in a surgical recovery room. Data on patient demographics, medical information and current care provided will be collected from the patient and from the clinical team. The patient's vital sign measurements, (respiratory rate, oxygen saturation, blood pressure, heart rate, conscious level), will be checked by the study team using the hospital's equipment. If it is inappropriate for a patient's vital signs to be checked – for example if the clinical team has made the decision to refrain from vital sign observations as the patient is in the final stage of dying, (may be termed 'on an end-of-life pathway', "moribund", 'gasping' or 'late palliative phase' by the clinical team), or if the patient refuses permission to measure their vital signs – then the patient will be included in the study but vital signs will not be measured. It will be acceptable for the study team to record the last vital signs recorded in the patient's file for these patients. For women in active labour, the vital signs will be measured between contractions. Detailed data collection procedures will be described in the study's Standard Operating Procedures. Data will be collected by clinician investigators, and/ or clinician researchers working at the site.

7.3.4 Outcomes

The patient outcomes will be reported as alive and discharged, died, or alive and still in hospital censored at 7-days.

7.4 End of Study Definition

The end of the study is defined as the end of the 7-day follow-up for the last included patient. Data analysis shall follow this.

8. Definitions

Critical illness (co-primary outcome): a state of ill health with vital organ dysfunction, a high risk of imminent death if care is not provided and the potential for reversibility.¹ Patients will be classified as critically ill if they have one or more severely deranged vital signs as in Figure 1. The cut-offs are those used in the Critical Illness and Sepsis Prevalence and Outcomes Study (CRISPOS) study and based on previous research in Tanzania and Sweden^{30,35,36} :

Criterion	Vital signs	Definition critically ill
Conscious level	Conscious level (AVPU Scale)	P or U
Respiratory	Respiratory rate per minute	<8 or >30
	Oxygen saturation (%)	<90
Circulatory	Heart rate per minute	<40 or >130
	Systolic blood pressure (mmHg)	<90

Figure 1: Criteria for the definition of critical illness

Hospital population: all adult patients aged 18 years or over who have been admitted for inpatient care in any department or ward in participating hospitals on the day of data collection.

Essential Emergency and Critical Care (EECC): the care that all critically ill patients should receive, in all hospitals in the world including clinical processes such as oxygen therapy, intravenous fluids and patient positioning to protect the airway, as described in the 2021 global consensus.¹⁰

Availability of resources for EECC: The 66 resources necessary for the provision of EECC including items such as pulse oximeters, oxygen masks and intravenous fluids.¹⁰

Coverage of EECC: The proportion of critically ill patients receiving EECC.

Patients will be deemed to be receiving EECC if they are:

- critically ill due to the conscious level criterion (Figure 1) **and**:
 - are lying in the lateral position **or**

- have an oro-pharyngeal or naso-pharyngeal airway inserted in their pharynx **or**
- have an ongoing chin-life or jaw-thrust **or**
- have other airway protection
- critically ill due to a respiratory criterion (Figure 1) **and**:
 - are receiving oxygen
- critically ill due to a circulatory criterion (Figure 1) **and**:
 - are receiving intravenous fluids **or**
 - are receiving a vasopressor or inotrope

Acute Hospital: A hospital admitting acutely unwell patients – i.e. patients who have a recent onset or exacerbation of a somatic condition and require timely care. Acute hospitals can be owned and run by the government or by a private or other organisation. Hospitals that only admit chronically unwell patients, or only patients for rehabilitation, or only patients for elective surgery are not regarded as acute hospitals and are not eligible for participation in ACIOS. Hospitals, units and wards exclusively for patients with psychiatric conditions are not regarded as acute hospitals.

In-hospital mortality (co-primary outcome): Death in-hospital. Patients discharged alive are not followed-up at home.

1-day and 7-day outcomes: The defined time for the outcomes is from the point of inclusion of the patient into the study to hospital discharge or death, censored at 7-days.

9. Data Handling and Management

The papers containing identifiable patient data for the follow-up of clinical outcomes will be stored within a locked office in each hospital or institution. Data will then be pseudo-anonymised by generation of a unique numeric code and transcribed by local investigators onto an internet based electronic case-record file (e-CRF).

Each patient will only be identified on the e-CRF by their numeric code; thus the central co-ordinating study team cannot trace data back to an individual patient. A participant list will be used in each hospital/site to match identifier codes in the database to individual patients in order to record clinical outcomes and supply any missing data points. This participant list will be stored on a password-protected computer. Access to the data entry system will be based on the principle of least privilege and

will be protected by username and password delivered during the registration process for individual local investigators.

All electronic data transfer between participating hospitals and the co-ordinating institution will be encrypted using a secure protocol (HTTPS/SSL 3.0 or better). Data will be anonymised during the transcription process using the Research Electronic Data Capture (REDCap) tools hosted by Safe Surgery South Africa (SSSA) who will act as the data custodian. REDCap is a secure, web-based application designed to support databases and data capturing for research studies. Soft limits will be set for data entry, prompting investigators when data were entered outside these limits. In countries with poor internet access, paper case record forms may be forwarded to SSSA, for entry by SSSA. Pseudo-anonymised (coded) data may also be sent by encrypted e-mail to the coordinating institution if necessary. Each institution will maintain a secure trial file including a protocol, local investigator delegation log, ethics approval documentation, the participant list, etc. Copies of the relevant protocols, approvals and investigator lists will also be kept securely in an internal drive by SSSA. A final summary of included patients with aggregated data of patients, and outcomes will be produced for each hospital together with final data submission to double check for completeness and accuracy.

Individual patient data provided by participating hospitals remain the property of the respective institution, once the ACIOS report has been published. Once each local co-ordinator has confirmed the data provided from their hospital are both complete and accurate, they will be provided with a spreadsheet of the raw (un-cleaned) data for their hospital. In the ACIOS report, only summary data will be presented publicly, and all national, institutional and patient level data will be strictly anonymised.

10. Statistical Analysis

10.1 Sample size calculation

Our plan is to recruit as many hospitals as possible in as many African countries as possible. All eligible patients will be included in each hospital. We do not have a specific sample size.

10.2 Statistical analysis

An ACIOS statistical analysis plan (SAP) will be written prior to inspection of the final dataset. Data will be presented at a continental African level. All institutional and national level data will be anonymised prior to publication. Categorical variables will be described as proportions and will be compared using

chi-square tests. Continuous variables will be described as mean and standard deviation if normally distributed, or median and inter-quartile range if not normally distributed. Comparisons of continuous variables between groups will be performed using t-tests, one-way ANOVA or equivalent non-parametric tests as appropriate. Univariate and hierarchical, multivariable, multi-level logistic regression models will be constructed to determine the relationship between the presence of critical illness and mortality and the relationship between essential emergency and critical care provision and mortality.

Results of logistic regression will be reported with 95% confidence intervals. The models will be assessed with predefined sensitivity analyses to explore possible interacting factors and examine any effect on the results. A single final analysis is planned at the end of the study.

11. Ethical Considerations

The study will be carried out in accordance with the ethical principles in the International Conference on Harmonisation and Good Clinical Practice. Ethical approval will be obtained from the University of Cape Town with additional approvals in each country as required by national ethical committees, and from each institution as required by local regulatory requirements. Country Coordinators will be responsible for clarifying the need for ethical and regulatory approvals and for ensuring these are in place prior to data collection. Participating hospitals will not be permitted to record data without providing confirmation that the necessary ethical and regulatory approvals are in place.

The requirement for patient consent may vary according to national regulations. We anticipate that patient consent will not be required by most, or even all, nations on the basis that the study is, in effect, a large-scale clinical audit, the dataset will only include variables documented as part of routine clinical care, and identifiable patient data will not leave the treating hospital. Most importantly, critically ill patients are frequently unable to consent for themselves due to a decreased level of consciousness and a requirement of consent would exclude the very patients we most wish to help. Therefore, we will use 'broadcasting' signage informing patients and families that the site is participating in the study, if required by regulations to ensure patients are aware of the study (Appendix 1). A precedent for this approach was set internationally with the EuSOS and ASOS studies. In EuSOS, consent was waived in 27 of the 28 European countries participating,³⁷ and in the ASOS-1³⁸ and ASOS-2³⁹ consent was waived in the majority of hospitals.

There is an ethical consideration when the study team observes a patient that is critically ill (see the Definitions section 8) requiring urgent care. On these occasions, the study team will immediately notify the clinical team about the patient's condition and provide them with the patient's vital signs. The treating clinicians will therefore be timeously alerted to the status of the patient, and will be able to manage the patient according to local protocols. In each hospital, the study team will offer to document the patients' vital signs in the medical records – as in some low resource hospitals, patients' vital signs are not checked daily due to a lack of human or material capacity, so the project may contribute to an improvement to the standard of care.

As the data will only be submitted once the e-CRFs are complete, and the steering committee will only analyse the data after data collection is complete (and not in real time), the investigators will be unable to intervene in the clinical management of patients.

12. Safety considerations

There are no safety considerations relating to the study. There is no risk of harm to either patients or investigators.

13. Monitoring and Auditing

ACIOS study documents may be selected by the Sponsor to ensure study activities are conducted according to the protocol, the Sponsor's standard operating procedures, Good Clinical Practice and the applicable regulatory requirements. In participating hospitals, local study documents may also be selected for audit on a local basis. The ACIOS study team will not routinely monitor data collection in individual hospitals or conduct source data verification.

14. Study Committees

14.1 Study Management Team

ACIOS will be led by the Study Management Team who will be responsible for study administration, communication between project partners, data collection and data management.

14.2 Steering Committee

A Steering Committee will be responsible for overseeing the study and its scientific conduct.

14.3 Country Coordinators

Country Co-ordinators will be selected to lead the project within their country and:

- Identify hospitals and local co-ordinators in participating hospitals.
- Assist with translation of study paperwork as required.
- Ensure distribution of research manuals, data collection forms and other materials.
- Ensure necessary regulatory approvals are in place prior to the start date.
- Ensure good communication with the participating sites in the country.

14.3 Local Coordinators

Local co-ordinators in individual hospitals will have the following responsibilities:

- Provide leadership for the study in their hospital.
- Ensure all relevant regulatory approvals are in place for their institution.
- Ensure adequate training of all relevant staff prior to data collection.
- Supervise data collection and assist with problem solving.
- Act as guarantor for the integrity and quality of data collected.
- Ensure timely completion of e-CRFs.
- Communicate with the relevant national coordinator.

15. Dissemination and Publication Plan

The Steering Committee will appoint a writing committee to draft the ACIOS scientific report(s) which will be disseminated in a timely manner. The African Partnership for Perioperative and Critical Care Research (APPRISE) group authorship guidelines will be followed. It is anticipated that a number of secondary analyses will be performed. ACIOS investigators and coordinators will be given priority to lead such analyses and are encouraged to do so. Participation and authorship opportunities will be based on contribution to the primary study. The Steering Committee will consider the quality and validity of any proposed study, the statistical analysis plan, a data sharing agreement, objectives that are in-line with the wider aims of the ACIOS project, scientific validity and the possible effect on the anonymity of participating hospitals prior to granting any requests for additional studies. Where

necessary, a prior written agreement will set out the terms of such collaborations. The Steering Committee must approve the final version of all manuscripts including ACIOS data prior to submission, whether they relate to part or all of the ACIOS dataset. In the event of disagreement within the Steering Committee, the Chief Investigators will make a ruling. Any analysis incorporating ACIOS data from two or more study sites will be considered a secondary analysis and subject to these rules. The full study report will be submitted to the funder and will also be made accessible via clinicaltrials.gov.

16. Deliverables

The main deliverables will be scientific reports of findings for general and specialty journals, abstracts for presentation to national and international meetings including those of the supporting societies and a final report summarising the overall findings.

17. Finance and Funding

The ACIOS study is funded by the NIHR through the Global Health Group on Perioperative and Critical Care grant (NIHR133850). The funders will play no role in study design, conduct, data collection, data analysis, reporting or interpretation of the results.

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Appendices

Appendix 1 – Broadcasting document

IMPORTANT PATIENT INFORMATION

A research study is being conducted atHospital.

The research study is being done by Dr from the Department of

Why is this research study being done?

To understand how sick patients are in hospital.

Why are we telling you about this research study?

All patients in this hospital are part of the research study. It is a requirement that some details pertaining to your clinical care are entered into a research study folder. Information from this folder will be used anonymously to understand how sick patients are in hospital, and what we might be able to do to improve the care for sick patients.

Will this research study affect my care while I am in hospital?

No. You will still receive the same care while you are in hospital.

Will my name or any personal details be kept by this research study?

No. Your name and personal details will not be kept as part of this research study. All information from the notes will be kept strictly confidential.

Are there any risks or benefits associated with this project?

No. There are no risks or direct benefits associated with this research study.

Who should I contact if I have any questions or concerns?

Please contact Dr on telephone.....

If you have questions about your rights or welfare as a participant, please contact the UCT Faculty of Health Sciences Human Research Ethics Committee on +27 (0)21 406 6338. **2**

Appendix 2 – Case record forms (CRFs)

2a: Hospital level CRF

African Critical Illness Outcomes Study (ACIOS) – Hospital CRF

Section 1: Hospital characteristics

1. Language preference: ☐ English ☐ French ☐ Arabic ☐ Portuguese ☐ Other

2. Hospital name:

3. Country:

4. Level of hospital:

☐ First-level (e.g. district) ☐ Second-level (e.g. Regional) ☐ Third-level (e.g. University/Central/National)

5. Type of hospital: ☐ Government ☐ Private ☐ Charitable

6. Total number of hospital beds: Total

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7. Number of beds in High Care Units: Total

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8. Number of beds in ICUs: Total

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9. Population served (catchment) of the hospital:

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Section 2: Available Resources

Are the following available in your hospital?

	EQUIPMENT	Always	Sometimes	Never	Don't know
1	Clock with second hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Pulse oximeter & probe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Blood pressure measuring equipment (eg. sphygmomanometer with a stethoscope)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Blood pressure cuffs of different paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Light source (lamp or flashlight)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Thermometer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Suction machine (electric or manual)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Oxygen supply 24h/day (cylinder, concentrator (with electricity supply) or piped oxygen)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Flow meter (if using cylinder or piped oxygen)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	Leak-free connectors from oxygen source to tubing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	Bag Valve Mask (resuscitator) – neonatal, paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12	Sharps disposal container	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	External heat source	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	CONSUMABLES	Always	Sometimes	Never	Don't know
14	Soap or hand disinfectant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Examination gloves	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Suction catheters of paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Guedel airways of paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Pillows	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	Oxygen tubing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Oxygen nasal prongs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21	Oxygen face masks of paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Oxygen face masks with reservoir bags of paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Masks for Bag Valve Mask (resuscitator) – neonatal, paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Compression bandages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Plasters or tape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26	Gauze	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Intravenous cannulas of paediatric and adult sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Intravenous giving sets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Skin disinfectant for cannulation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	Syringes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31	Nutrition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32	Nasogastric tubes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33	Lubricant for nasogastric tube insertion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34	Intramuscular needles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35	Intraosseous cannulas of different sizes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36	Blankets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
37	Facemasks for Infection Prevention and Control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38	Aprons or gowns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
39	Charts/notes for documentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
40	Pens	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	DRUGS	Always	Sometimes	Never	Don't know
41	Oral rehydration solution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

42	Intravenous crystalloid fluids (eg. normal saline or Ringer's Lactate)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
43	Intravenous dextrose fluid (eg. 5%, 10% or 50%)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
44	Oxytocin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
45	Adrenaline	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
46	Appropriate antibiotics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
47	Diazepam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
48	Magnesium sulphate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
49	Paracetamol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
50	Local anaesthetic (eg. 2% lignocaine) (eg. for intraosseous cannulation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	HR	Always	Sometimes	Never	Don't know
51	Health workers (eg nurses) with the ability to identify critical illness 24h/day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
52	Health workers with the (eg nurses) ability to care for critically ill patients 24hrs/day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
53	Senior health worker (eg doctor) who can be called to assist with the care of critically ill patients 24hrs/day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	TRAINING	Always	Sometimes	Never	Don't know
54	The health workers are trained in the identification of critical illness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
55	The health workers are trained in the care of critically ill patients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	ROUTINES	Always	Sometimes	Never	Don't know
56	The hospital has well-defined routines for the identification of critical illness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
57	The hospital has well-defined routines for managing critically ill patients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
58	There is a routine for the provision of EECC without taking into account patients' ability to pay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
59	There are routines for who and how to call to seek senior help 24hrs/day, 7 days/week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
60	There are routines for integrating EECC with other care including the definitive care of the underlying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	condition (eg. use of condition-specific guidelines)				
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	GUIDELINES	Always	Sometimes	Never	Don't know
61	There are written guidelines for the identification of critical illness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
62	There are written guidelines for the essential care of critically ill patients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	INFRASTRUCTURE	Always	Sometimes	Never	Don't know
63	Designated triage area (area for the identification of critical illness) in the Out-Patient Department or Emergency Unit (area of the hospital where patients arrive)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
64	Running water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
65	Designated space for the care of critically ill patients (eg. a bay, ward, high care unit)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
66	Areas for separating and managing patients with a suspected or confirmed contagious disease from those without	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2b: Patient's bedside CRF

African Critical Illness Outcomes Study (ACIOS) – Patient CRF

Clinical assessment

Date of assessment: d m y y y y

Vital signs done by the investigating team: ☐ Y ☐ N If no, specify ☐ Vital signs from patient records ☐ Not done

Position of patient:

☐ Lying flat on back(<30°) ☐ Lying on side ☐ Head-up(30°-60°) ☐ Sitting(>60°) ☐ Head-down ☐ Other

Airway patency: ☐ Normal ☐ Partial obstruction ☐ Complete obstruction

Conscious level (AVPU): ☐ Alert ☐ Responds to Voice ☐ Responds to Pain ☐ Unresponsive

Heart rate /min Oxygen saturation % Respiratory rate /min

Systolic blood pressure /mmHg Diastolic blood pressure /mmHg

Currently receiving IV fluids ☐ Y ☐ N Receiving oxygen (now) ☐ Y ☐ N

Receiving vasopressor/inotrope (now) ☐ Y ☐ N Airway action (now) ☐ Y ☐ N

Circle the worst pain you had in the last 24 hours: 0 (no pain) 1 2 3 4 5 6 7 8 9 10 (worst pain you can imagine)

Other information

Date of hospital admission: d m y y y y Urgency of admission: ☐ Emergency/acute ☐ Elective

Age years Sex ☐ M ☐ F

Ward type: ☐ Medical ☐ Surgical ☐ Maternal ☐ Other

Ward level: ☐ General ward ☐ High care unit/HDU ☐ ICU

Main category for admission: ☐ Non-communicable disease ☐ Maternal health ☐ Trauma ☐ Infection

Known chronic disease or pregnancy (tick all that apply):

☐ Pregnant ☐ Hypertension ☐ Diabetes ☐ Cancer ☐ COPD / Asthma

☐ Heart Disease ☐ HIV / AIDS ☐ Tuberculosis ☐ Other ☐ None

Any surgery during this admission: ☐ Y ☐ N Treatment limitations (e.g. not for resuscitation): ☐ Y ☐ N

Follow-up

Total days in hospital from admission to discharge

Status at 7th day in-hospital after clinical assessment: ☐ Discharged Alive ☐ Alive still in-hospital ☐ Died

Date of discharge or death d m y y y y

ACIOS unique patient ID

Patient name: _____

DOB d m y y y y

Patient hospital number _____

Ward _____ Bed _____

Definitions:

Position of patient: The position the patient is in the bed/chair when the investigating team arrive at the bedside. The number of degrees refers to the angle of the head and body compared to the legs.

Airway patency: Normal is an unobstructed airway. Partial obstruction may be indicated by stridor, secretions in the airway identified by gurgling, or snoring. Complete obstruction is evident by a see-saw chest movement (chest down and abdomen up with attempted breathing against a closed glottis). Complete obstruction is an airway emergency and requires calling the attending clinical team immediately.

Conscious level AVPU: Measurement of conscious level. Is the patient Alert = A. If they are not alert but they respond to your voice = V. If they don't respond to voice but respond to a painful stimulus = P. If they remain unresponsive even with a painful stimulus = U (unresponsive).

Currently receiving IV fluids: At the time of clinical assessment, the patient is receiving IV fluids if IV fluids are hanging at the bedside, and currently dripping into an intravenous cannula, or the patient has been receiving fluids as described within the previous few minutes but is now finished and a new fluid is being prepared to be administered.

Receiving oxygen (now): At the time of clinical assessment, the patient is receiving oxygen if supplementary oxygen is currently flowing into a nasal cannula, face mask or other delivery device that is correctly fitted so that oxygen is entering the patient's lungs.

Receiving vasopressor/inotrope (now): Ongoing care with a vasopressor or inotrope infusion – for example noradrenaline, adrenaline, dopamine or dobutamine.

Airway action (now): An action to open the airway or maintain a free airway. For example: chin lift, jaw thrust, oro-pharyngeal airway, naso-pharyngeal airway, intubated patient.

High care unit/HDU: A unit or ward or part of a ward which is dedicated to providing an increased level of care when compared to a general ward. High care units often have increased nurse:patient ratios, more equipment and more advanced care such as oxygen, CPAP, vasopressors etc. This does *not* include units with mechanical ventilation, as that is an ICU. Includes recovery rooms providing an increased level of care.

ICU: A unit or ward which is dedicated to providing an increased level of care when compared to a general ward or high care unit including mechanical ventilation.

Main category for admission: The main diagnosis or reason that the patient is being treated in hospital.

Treatment limitations: A patient has a treatment limitation if the clinical team have made the clinical judgement that some treatments would not be in the patient's best interest. For example "DNR" (do not resuscitate in the event of a cardiac arrest), or "Not for ICU" in the event of deterioration.

Days in hospital: Total number of days in hospital from admission.

Status at hospital discharge or 7th day in-hospital after clinical assessment: The survival status of the patient at hospital discharge, or at the 7th day after clinical assessment (if the patient had not yet been discharged). The study is censored at the 7th day after clinical assessment.

Guidance for use of paper case record form (CRF)

1. Investigators should write the patient's name and date of birth on the bottom of the CRF. When you enter the data on the internet based CRF you will receive an ACIOS patient ID. Please write this on the paper CRF as well in case we need to contact you to check your data.
2. The clinical assessment and the patient's vital signs **MUST** be completed at the same time by the investigating team. Only in exceptional circumstances can the vital signs data be taken from the medical records.
3. Please take care to enter the date clearly and correctly. Mistakes are common data describing time and date.