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Cardiac Arrest and Cardiopulmonary Resuscitation Outcome Reports: 2024 Update of the Utstein Out-of-Hospital Cardiac Arrest Registry Template

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ABSTRACT: The Utstein Out-of-Hospital Cardiac Arrest Resuscitation Registry Template, introduced in 1991 and updated in 2004 and 2015, standardizes data collection to enable research, evaluation, and comparisons of systems of care. The impetus for the current update stemmed from significant advances in the field and insights from registry development and regional comparisons. This 2024 update involved representatives of the International Liaison Committee on Resuscitation and used a modified Delphi process. Every 2015 Utstein data element was reviewed for relevance, priority (core or supplemental), and improvement. New variables were proposed and refined. All changes were voted on for inclusion. The 2015 domains—system, dispatch, patient, process, and outcomes—were retained. Further clarity is provided for the definitions of out-of-hospital cardiac arrest attended resuscitation and attempted resuscitation. Changes reflect advancements in dispatch, early response systems, and resuscitation care, as well as the importance of prehospital outcomes. Time intervals such as emergency medical service response time now emphasize precise reporting of the times used. New flowcharts aid the reporting of system effectiveness for patients with an attempted resuscitation and system efficacy for the Utstein comparator group. Recognizing the varying capacities of emergency systems globally, the writing group provided a minimal dataset for settings with developing emergency medical systems. Supplementary variables are considered useful for research purposes. These revisions aim to elevate data collection and reporting transparency by registries and researchers and to advance international comparisons and collaborations. The overarching objective remains the improvement of outcomes for patients with out-of-hospital cardiac arrest.

Key Words: AHA Scientific Statements ■ cardiopulmonary resuscitation ■ heart arrest ■ out-of-hospital cardiac arrest ■ registries ■ resuscitation

The International Liaison Committee on Resuscitation's (ILCOR's) vision is to save more lives globally through resuscitation.[1] ILCOR has a long history of promoting international collaboration in research and registries to help improve the understanding of cardiac arrest.[2] Part of this history[3] includes the release and periodic updates of the Utstein template for out-of-hospital cardiac arrest (OHCA), which aims to guide and standardize OHCA data collection and reporting.[4–7]

The main purposes of OHCA data collection are surveillance, quality improvement, and research. However, the scope of OHCA data collection, which is influenced by goals, funding, and resources, spans from minimal datasets for sustainability in resource-constrained settings to comprehensive data capture in well-funded studies. In recognition of this diverse data burden, the most recent iteration of the template in 2015 introduced flexibility in data collection by dividing the data collected into core

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data, aimed at surveillance and quality improvement, and supplementary data, tailored more for research purposes.

The widespread adoption of the OHCA Utstein template has resulted in a noticeable increase in reported data and has enabled the establishment of large regional registries[8–11] and the reporting of global OHCA registry data by ILCOR.[12,13] This collation of data has, however, highlighted areas in the template in need of review.[14,15]

Periodic reviews of the template provide the opportunity to address identified issues and to update the data to reflect current systems of care and patient management. This 2024 update aimed to clarify existing definitions, to update variables to reflect recent changes,[16–19] and to provide useful reporting tools while enabling varying levels of granularity in registry data collection. This revised template is applicable to pediatric and adult OHCA; separate templates cover neonates[20] and in-hospital cardiac arrest.[21,22] Additional templates and standards guide more detailed data collection for dispatch,[23,24] special circumstances,[25–29] patient outcomes,[30–33] and organ donation[34,35] (Table 1).

METHODS

This update took place in 2 phases: (1) a review of the use and application of the 2015 Utstein template and (2) a modified Delphi process to reach a consensus on all changes and additions.

Use and Application of the 2015 Template

To help inform changes needed in the OHCA template, we first examined the use of the 2015 Utstein template and its elements in the years since publication by reviewing citing publications and OHCA registry annual reports.

Table 1. International Standards to Guide Additional Data Collection and Reporting

Subject	Publication
Neonatal	2023: Neonatal Utstein Style[20]
IHCA	2019: Utstein for In-Hospital Cardiac Arrest[21,22]
Drowning	2015: Utstein Drowning-Related Resuscitation[25,26]
Pregnancy	2015: Cardiac Arrest in Pregnancy[27]
Stroke	2020: Utstein Recommendation for Emergency Stroke Care[29]
Trauma	2008: Utstein Template for Major Trauma[28]
Dispatch	2008: Utstein Dispatch[23] 2020: Telecommunicator Cardiopulmonary Resuscitation[24]
COSCA adults	2018: Core Outcome Set for Cardiac Arrest in Adults[30,31]
COSCA pediatrics	2021: Pediatric Core Outcome Set for Cardiac Arrest[32,33]
Organ donation	2023: ILCOR Organ Donation After OHCA[34,35]

COSCA indicates Core Outcomes Set for Cardiac Arrest; IHCA, in-hospital cardiac arrest; ILCOR, International Liaison Committee on Resuscitation; and OHCA, out-of-hospital cardiac arrest.

To do this, we extracted a list of publications that cited the 2015 Utstein template from Scopus (Elsevier) on December 13, 2021. One author (Z.D.) reviewed the full text of citing publications. For original research articles written in English, data were extracted for study design and population studied, definition of attempted resuscitation, use of data items listed in the 2015 template, and use of tools and reporting of the Utstein subgroup (bystander witnessed in an initial shockable rhythm). A similar approach was used to review OHCA registry annual reports, which were sourced from the writing group. These data were summarized and used by the writing group to inform the revision and consensus process.

The Modified Delphi Process

A modified Delphi methodology was used to reach consensus.[36] All meetings were held online. The electronic surveys and voting were conducted separately from the meetings, and all responses shared with the writing group were presented in a deidentified format. The writing group was instructed at each stage to consider the ramifications of any suggested changes on existing registries and backward compatibility.

Initially, we conducted an online survey with the writing group to identify which data items within the 2015 Utstein template required a comprehensive review and to determine potential new variables for inclusion. The participants were initially tasked with assigning a ranking (core, supplemental, or no longer required) to each existing variable. Subsequently, they were prompted to specify areas where modifications were deemed necessary for each variable, including definitions or data options, and to offer suggestions for potential changes. A summary of the results of this survey was then presented to the group for discussion.

In the next stage, the group was asked to join at least 1 of 5 working groups to discuss the survey results and to draft recommended changes. Each working group focused on one of the domains from the 2015 Utstein template and was instructed to examine each core and supplemental data item but with a detailed review of items that >75% of the writing groups voted as requiring changes. All new proposed items were discussed, with definitions and data options determined for items deemed to be of value and feasible to collect. All changes recommended by the working groups were then presented and discussed among the whole writing group. These changes then went through iterative improvements, by online surveys and additional discussions, until all changes achieved a minimum of 85% agreement to meet our definition of consensus. When consensus was not reached after 2 surveys and discussions, the items from the 2015 Utstein template were retained without modification. The writing group drafted and, along with the ILCOR Board, approved the final manuscript. Authors of previous versions are acknowledged.

RESULTS

Review of Citing Studies

We examined 766 publications that cited the 2015 Utstein template publications.[6,7] Of these, we examined the full text of 546 original research articles (excluding editorials, reviews, commentaries, and animal studies) conducted in >40 countries. Most studies used registry data (70%), with the remainder collecting data (23%) or using secondary sourced data (7%). Most studies aimed to identify predictors of survival (56%) or to report epidemiology (18%) in adult OHCAs. Most studies included all causes (45%) or medical/nontraumatic subgroupings (38%). Missing data were typically excluded from analysis (41%), or their handling was not described (38%).

Core variables with low reporting rates (<10%) included dispatcher activity (recognition, 3.6%; cardiopulmonary resuscitation [CPR] instructions, 8%) and bystander defibrillation (<0.2%). Some of the supplementary variables from the 2015 Utstein template were not reported or were reported infrequently in citing studies, including independent living (4.8%), use of a ventricular assist device (0%) or an intra-aortic balloon pump (2.5%), presence of ST-segment–elevation myocardial infarction (4.8%), drug delivery timings (3.8%), CPR quality (3.3%), vascular access (3.2%), oxygen targets (0%), glucose values (1.1%), number and type of prognostication tests (2.4%), hospital volume (1.6%), 12-lead ECG (0.2%), and blood pressure (blood pressure targets, 0%). Supplementary outcomes were rarely used in citing studies: transported to hospital (2.2%), cause of death (1.3%), treatment withdrawn (1.3%), organ donation (1.3%), patient-reported outcomes (2.7%), and quality of life (3.3%). Only 6% of studies reported outcomes for the Utstein comparator group.

Review of OHCA Registry Annual Reports

We also examined OHCA annual reports provided by the writing groups. These reports included multinational, national, and regional registries (Supplemental Material 1 Table S1). Of note in this review were the variations seen in the cases included and the definition of the Utstein comparator group used for benchmarking. The 2015 Utstein template describes this subgroup simply as bystander-witnessed cases with a shockable rhythm in the text, with the flowchart adding emergency medical service (EMS)–attempted resuscitation to the definition. However, annual reports from some registries have included additional inclusion and exclusion criteria when reporting on this group such as limiting the population to adults or presumed cardiac or nontraumatic cases. Variation was also seen in whether this group included all cases or was limited to EMS-attempted resuscitation. Another common variation on the 2015 Utstein template was the use of different categories for location (private residence, public, medical/health care), and many registry reports included scene outcomes (eg, transported with return of spontaneous circulation [ROSC]/CPR, died). Few reports described elements from EMS and hospital processes (eg, drug administration, targeted temperature management, coronary reperfusion). No annual report reviewed described organ donation.

Consensus Process

Sixteen authors participated in the consensus process, including nurses, paramedics, and physicians involved in EMS response, emergency medicine, and critical care. Through 3 rounds of surveys, 25 items were redefined or modified, 1 core and 13 supplemental items were added, 7 items had details added to their definitions, 5 items were dropped, 4 items were moved to system description, and 1 item was moved from supplementary to core. A comparison with the 2015 Utstein is provided in Supplemental Material 1 Table S2, and changes are described here.

OHCA Utstein Definitions and Discussion of Changes

We retained the 5 domains and the separation of core and supplemental items as used in the 2015 Utstein template (Figure 1). The revised data definitions and options are summarized in Table 2. To reflect modern terminology, we have changed the term victim in relevant definitions. Like previous templates, most data in this revision apply to regions covered by an EMS. For regions with developing EMS, we have created recommendations in the Special Circumstances section.

Systems

A structured system description provides context and enables system comparisons. Critical for surveillance, research, and registry reporting are the number of cases of OHCAs attended, the number of cases with attempted resuscitation, and the reasons why resuscitation was not attempted.

In this revised template, OHCA attended is defined as patients without signs of circulation as assessed or confirmed by EMS plus patients with ROSC after confirmed defibrillation before EMS arrival. We recognize that confirmed defibrillation before EMS arrival may be challenging and impractical for some registries to collect. However, these patients are important in reports of outcomes from a systems perspective. Patients who achieve a rapid ROSC and consciousness after initiation of chest compressions should be carefully reviewed, ideally with hospital medical records, before being included as OHCA.[37] In regions with developing EMS where patients may not be attended or transported to hospital by EMS, confirmation of cardiac arrest by medical or nursing staff on hospital arrival is an acceptable alternative. Resuscitation attempted should include all attended OHCA cases in which dispatched personnel

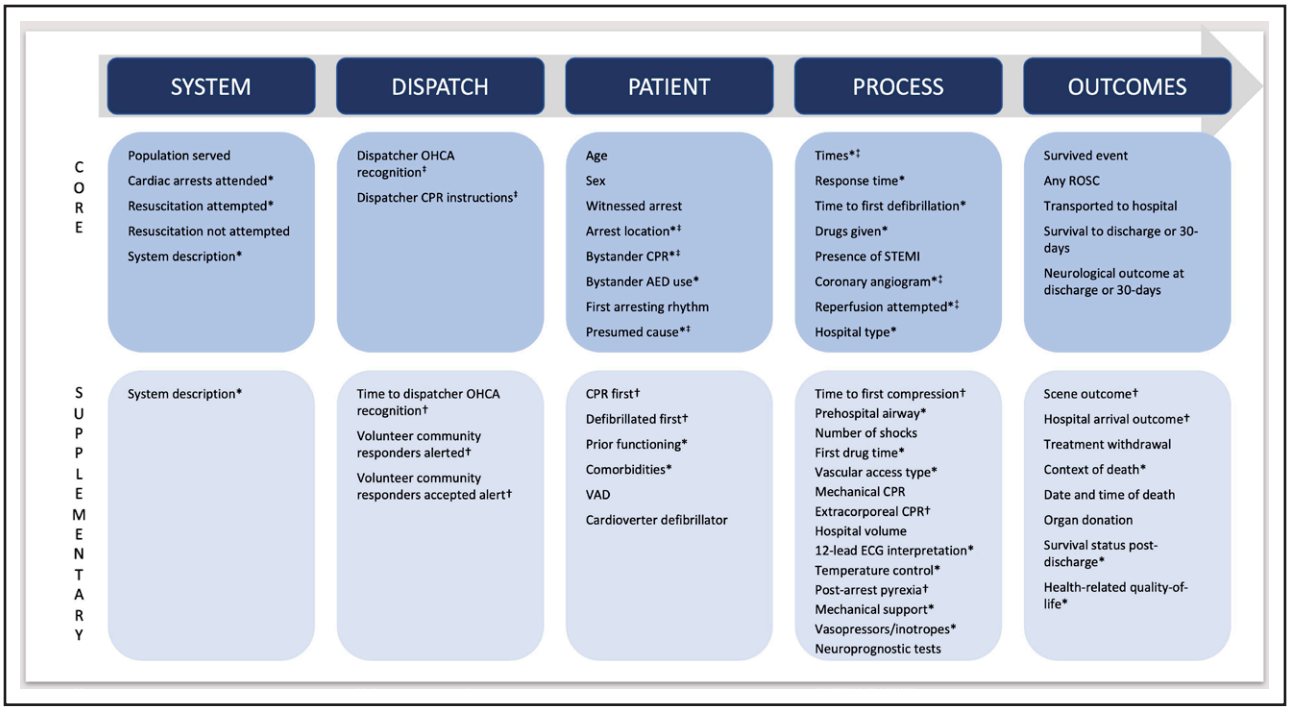

Figure 1. Core and supplementary items by domain in the 2024 Utstein template.
AED indicates automated external defibrillator; CPR, cardiopulmonary resuscitation; OHCA, out-of-hospital cardiac arrest; ROSC, return of spontaneous circulation; STEMI, ST-segment–elevation myocardial infarction; and VAD, ventricular assist device. *Modified from 2015 Utstein. †New variable. ‡Includes supplementary options.

perform chest compressions, defibrillations, or other related emergency care or confirmed defibrillation occurs before EMS arrival. When registries include patients receiving other emergency care among the attempted resuscitation group, they should describe how it was defined. The resuscitation not attempted item is unchanged.

The core system elements include the characteristics of the underlying population served, structure of the EMS response, resuscitation practices and policies, and other relevant health system characteristics (Table 3). New items added to this list highlight the importance of dispatchers[38] and changes to systems and practice such as volunteer community first-responder programs[39] and high-performance CPR.[40] Items such as measures of CPR quality, capability for 12-lead ECG, blood pressure, and oxygenation/ventilation practice have been moved from other domains to the system description.

Dispatch

The significance of emergency dispatchers, also known as emergency call takers and telecommunicators, in the OHCA chain of survival has received increasing attention.[38,41] Their importance has been emphasized in an ILCOR emergency medical dispatch statement,[23] in an American Heart Association policy statement on telecommunicator CPR,[24] and in international guidelines.[42,43]

Although we acknowledge that collecting dispatch data may pose challenges for registries and researchers, especially when the calls are managed by external agencies or necessitate listening to emergency calls, we have retained dispatcher OHCA recognition and dispatcher CPR instructions as core data given their importance to OHCA survival.[44] We have opted to add supplemental variables that reflect important advances in dispatch, including time to dispatcher OHCA recognition, volunteer community responder alerts, and volunteer community responder accepted alert. Volunteer community responders are defined as volunteers who are alerted to a potential OHCA (eg, by a smartphone application [app] or text message) but are not dispatched to the scene as part of the emergency call and are under no obligation to attend.[45] These community responders include off-duty health care professionals but not dispatched responders (eg, fire, police, or EMS).

For researchers and registries seeking to collect additional dispatch data and establish standardized definitions, the writing group recommends reference to the ILCOR[23] and the American Heart Association[24] statements (Table 1).

Patient

For patient variables, we have made minor adjustments to variable names (eg, changed gender to sex) to reflect the data definitions. The presence of ST-segment–elevation myocardial infarction variable has been moved to the process postresuscitation domain. We discussed removing supplemental variables that are rarely collected and reported (eg, ventricular assist devices), but a consensus on removal was not reached.

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Table 2. Utstein 2024 OHCA Data Items, Descriptions, and Recommended Coding Options

Utstein OHCA item	Consensus definition 2024	Data options
System core		
Population served	Total population of service area of EMS system	Number of cases
Cardiac arrests attended	Number of cardiac arrests attended (defined by absence of signs of circulation as assessed or confirmed by EMS, including patients with ROSC after confirmed defibrillation before EMS arrival)	Number of cases
Resuscitation attempted	Number of cardiac arrests attended in which dispatched responders* perform chest compressions, defibrillations, or other related emergency care or where a confirmed defibrillation occurs before EMS arrival When registries include other emergency care among the attempted resuscitation group, they should describe how it was defined in system description	Number of cases
Resuscitation not attempted	Total number of cardiac arrests in which resuscitation was not attempted and number of those arrests not attempted because a written DNACPR order was present, the patient was obviously dead, or signs of circulation were present	Number of cases Number with DNACPR, number considered futile, number with signs of circulation, number unknown
System description	A description of the organizational structure of the EMS	Number and type of EMS tier; providers' skill set; number of EMS calls, excluding interfacility transfers; population served according to census data; footprint served in square kilometers or square miles; other related emergency care included as resuscitation attempted; additional responder programs*
System supplemental		
System description (supplemental)	Additional system information: Free-text description defining/describing (1) the presence or existence of legislation that mandates that no resuscitation should be started by EMS or health services in specific circumstances or clinical cohorts of patients; (2) criteria for limiting/terminating prehospital resuscitation; (3) termination of resuscitation rules; (4) dispatch software used (type, version); (5) resuscitation council's algorithms followed (eg, AHA, ERC) and any local variations; (6) methods of case ascertainment and formalized data quality activities in place; (7) prehospital electrocardiographic capability; (8) measures of CPR quality used; (9) post-ROSC vital sign targets (eg, BP, oxygenation); (10) patient transport policies; (11) regional availability of postresuscitation care (eg, cardiac intervention)	Free text See Table 3.
Dispatch core		
Dispatcher OHCA recognition	Dispatcher identified the presence of cardiac arrest before the arrival of dispatched responders*	Yes/no/unknown/not recorded (Supplemental: CPR already underway/caller not on scene/unable to access or position patient/caller refused/unsafe scene/caller hung up/language barriers/other circumstances)
Dispatcher CPR instructions	Dispatcher provided telephone CPR instructions to the caller	Yes/no/unknown/not recorded (Supplemental: OHCA not recognized/CPR already underway/caller not on scene/unable to position patient/caller refused/unsafe scene/caller hung up/language barriers/other circumstances)
Dispatch supplemental		
Time to dispatcher OHCA recognition	Time to dispatcher OHCA recognition is the interval between time points 1 and 2. Time points are defined under times. The same interval should be used for all patients. Gold standard time points are the recommended times below. Time point 1: Estimated time of arrest Time of call Call answered by PSAP Call answered by EMS agency or secondary PSAP (recommended) Time point 2: Time dispatcher identifies cardiac arrest (recommended)	mm:ss/unknown/not recorded
Volunteer community responders* alerted	Volunteer community responders* alerted to attend the OHCA location (eg, by smartphone app) Responders may include off-duty health care professionals but not dispatched responders* (eg, fire, police). "Not applicable" may apply if the dispatch system does not alert for all OHCA cases.	Yes/no/unknown/not recorded/not applicable
Volunteer community responders* accepted alert	Volunteer community responders* accept the alert to attend the OHCA location. "Not applicable" may apply if the dispatch system does not alert for all OHCA cases.	Yes/no/unknown/not recorded/not applicable

(*Continued*)

Table 2. Continued

Utstein OHCA item	Consensus definition 2024	Data options
Patient core		
Age	If the person's date of birth is known, it should be recorded in an acceptable format. If the date of birth is not known but the person's age is known, age should be recorded. If the person's age is not known, age should be estimated and recorded.	3 digits (state units: years, months, or days) Indicate whether estimated/unknown/not recorded Specify whether reported average ages include or exclude estimated ages
Sex	The person's biological sex at birth	Male/female/unknown/not recorded
Witnessed arrest	A cardiac arrest that is seen or heard by another person or is monitored Bystanders include off-duty health care professionals and volunteer community responders* alerted to the scene. EMS witnessed includes all dispatched responders* (ie, EMS, fire, police).	Bystander witnessed/EMS witnessed/unwitnessed/unknown/not recorded
Arrest location	Specific location where the event occurred or where the person was found Local factors may make the creation of additional subcategories useful. Supplemental: Detailed location will allow data linkage to facilitate linkage to population datasets (eg, census data).	Home or private residence/industrial or workplace/sports or recreation/street or highway/public building/assisted living or aged care/health care or medical facility/educational institution/ambulance/other/unknown/not recorded (Supplemental: detailed location such as census block, street address, or X/Y coordinates of area)
Bystander CPR	CPR performed by a person who is on scene or alerted but not dispatched as part of an organized emergency response system Bystander CPR may be compression only or compression with ventilations. Bystanders include off-duty health care professionals and volunteer community responders.* Dispatched responders* should not be included as bystanders.	Yes/no/unknown/not recorded (Supplemental: compression only/compressions and ventilation/no bystander CPR/unknown/not recorded)
Bystander AED use	AED applied by a person who is on scene or alerted but not dispatched as part of an organized emergency response system Bystanders include off-duty health care professionals if they are not part of the emergency response system and volunteer community responders.* Dispatched first responders* should not be included as bystanders.	AED used, shock delivered/AED used, no shock delivered/AED used, unknown shock/AED not used/not recorded
First arresting rhythm	First cardiac rhythm present when the monitor or defibrillator is applied after a cardiac arrest	VF/pulseless VT/PEA/asystole/bradycardia/AED nonshockable/AED shockable/AICD shockable/unknown/not recorded (shockable/nonshockable/unknown/not recorded are acceptable alternatives if exact rhythms are not available)
Presumed cause	The most likely primary cause of the cardiac arrest This information should be collected from the same source for all cases and documented in reporting. Medical: Includes cases in which the cause of the cardiac arrest is presumed to be a medical cause (eg, cardiac, anaphylaxis, asthma, gastrointestinal bleed, SUID) or when there is no obvious cause of the cardiac arrest Traumatic: Cardiac arrest directly caused by blunt, penetrating, or burn injury Drug overdose: Evidence that the cardiac arrest was caused by deliberate or accidental overdose of prescribed medications, recreational drugs, or ethanol Drowning: Person is found submersed in water without an alternative causation Electrocution Asphyxial: External causes of asphyxia such as foreign-body airway obstruction, hanging, or strangulation Subgroupings may be used when an obvious cause is known. Other subgroupings (eg, mechanism of trauma) may be appropriate to local regions. Unknown is allocated to medical (presumed cardiac).	Medical (subgroups: presumed cardiac/unknown, respiratory, terminal illness, anaphylaxis, SUID, other medical) Trauma (subgroups: penetrating, blunt, burn injury) Drug overdose Drowning/electrocution Asphyxial (subgroups: hanging, foreign body, suffocation, strangulation) Not recorded
Patient supplemental		
CPR first	Person who provided CPR first A bystander is someone on scene A volunteer community responder is someone alerted to the scene First responders are non-EMS dispatched to the scene (eg, fire, police) EMS is a service with the ability to transport the patient to hospital	Bystander/volunteer community responder/dispatched first responder/EMS/other/unknown/not recorded

(*Continued*)

Table 2. Continued

Utstein OHCA item	Consensus definition 2024	Data options
Defibrillated first	Person who provided the first defibrillation A bystander is someone on scene A volunteer community responder is someone alerted to the scene First responders are non-EMS dispatched to the scene (eg, fire, police) EMS is a service with the ability to transport the patient to hospital	Bystander/volunteer community responder/ dispatched first responder/EMS/other/unknown/not recorded
Prior functioning	A validated measure of the level of functioning before the cardiac arrest. Consider using the same measure as outcomes (eg, CPC/mRS)	Measurement score/unknown/not recorded
Comorbidities	A validated measure of comorbidity (eg, CCI) Known presence of risk factors or other disease conditions that existed before the cardiac arrest (eg, cardiovascular, respiratory, allergies, cancer, previous cardiac arrest)	Measurement of comorbidity (eg, CCI) Presence of risk factors or illness (yes/no/unknown)
VAD	The patient is supported by any form of VAD to augment cardiac output and coronary perfusion	Yes/no/unknown/not recorded
Cardioverter defibrillator	The patient has an internal or external cardioverter defibrillator	Internal/external/no/unknown/not recorded
Process intra-arrest core		
Times	Recommended time collection: Call is answered by primary PSAP (first connection, "What is your emergency?"). Call is answered by EMS agency or secondary PSAP (agency responsible for EMS dispatch). EMS is dispatched. Dispatched responders arrive at a scene (wheels stop). First responders arrive at patient. EMS arrives at patient. Transporting EMS leaves scene for hospital (transported patients). Transporting EMS arrives at hospital (transported patients). Supplemental: Estimated time of arrest (if witnessed) Time of call: time bystander calls emergency number Time volunteer community responders alerted Time volunteer community responders at patient Time of sustained ROSC or resuscitation attempt ceased	Date (mm:dd:yyyy) Time (hh:mm)
Response time	Interval between time points 1 and 2 Time points are defined under timings, and the same interval should be used for all patients. Gold standard time points are the recommended times below. Time point 1: Estimated time of arrest Time of call Time call connects to primary PSAP (recommended) Time call answered by EMS agency or secondary PSAP Time point 2: Time dispatched first responders or EMS arrived at scene (wheels stop turning; recommended) Time dispatched first responders or EMS arrived at patient's side	mm:ss/unknown/not recorded
Time to first defibrillation	The interval between time points 1 and 2 Time points are defined under timings, and the same interval should be used for all patients. Times may be negative values if the patient is defibrillated before call. Gold standard time points are the recommended times below. Time point 1: Estimated time of arrest Time of call Time call connects to primary PSAP (recommended) Time call answered by EMS agency or secondary PSAP Time point 2: Time of first defibrillation (recommended)	mm:ss/unknown/not recorded

(*Continued*)

Table 2. Continued

Utstein OHCA item	Consensus definition 2024	Data options
Drugs given	Any drugs (epinephrine/adrenaline, amiodarone, lidocaine) given during resuscitation and the first route of access	Any drugs: yes/no/unknown/not recorded Epinephrine/adrenaline: no/intravenous/intraosseous/intramuscular/tracheal Amiodarone: no/intravenous/intraosseous/tracheal Lidocaine: no/intravenous/intraosseous/tracheal
Process intra-arrest supplemental		
Time to first compression	The interval between time points 1 and 2 Time points are defined under timings, and the same interval should be used for all patients. May be negative values if CPR is provided before the call. Gold standard time points are the recommended times below. Time point 1: Estimated time of arrest Time of call Call answered by PSAP (recommended) Call answered by EMS agency or secondary PSAP Time point 2: Time of first compression (recommended)	mm:ss/unknown/not recorded
Prehospital airway management	Main airway device used during resuscitation in the prehospital setting Supplemental: All airway devices attempted during resuscitation in the prehospital setting, sequence, and successful placement	Main airway: None used/oropharyngeal airway/supraglottic airway/tracheal tube/surgical airway/unknown/not recorded (Supplemental: Type attempted/sequence/success: Oral: Attempted/sequence/success Supraglottic: Attempted/sequence/success Tracheal intubation: Attempted/sequence/success Surgical: Attempted/sequence/success Other: Attempted/sequence/success)
Number of shocks	Number of shocks delivered (including shocks delivered by public-access defibrillators)	Number/unknown/not recorded
First drug time	The interval between time points 1 and 2 Time points are defined under timings, and the same interval should be used for all patients. Gold standard time points are the recommended times below. Time point 1: Estimated time of arrest Time of call Call answered by PSAP (recommended) Call answered by EMS agency or secondary PSAP Time point 2: Time of first drug (recommended)	mm:ss/unknown/not recorded
Vascular access type	Main route through which drugs were administered during the arrest	Central line/intravenous/intraosseous/tracheal/unknown/not recorded
Mechanical CPR	Use of a mechanical CPR device at any time during the resuscitation	Mechanical compression-decompression device/load-distributing band/other mechanical device/no/unknown/not recorded
Extracorporeal CPR	Use of extracorporeal CPR at any time during the resuscitation	Yes/no/unknown/not recorded
Process postresuscitation core		
Presence of STEMI	At the time of the first 12-lead ECG performed after ROSC, the presence of STEMI is observed.	Yes/no/unknown/not recorded
Coronary angiogram	Coronary angiogram is performed. Urgent coronary angiography is defined as within 6 h of cardiac arrest; delayed coronary angiography is defined as undertaken during the same hospital admission. Supplemental: date and time	Intra-arrest/urgent/delayed/no angiography/unknown/not recorded (Supplemental: date and time)
Reperfusion attempted	Coronary reperfusion attempted (eg, PCI, thrombolysis, CABG) Supplemental: date and time	PCI/thrombolysis/CABG/no reperfusion/unknown/not recorded (Supplemental: date and time)

(*Continued*)

Table 2. Continued

Utstein OHCA item	Consensus definition 2024	Data options
Hospital type	Transport (primary or secondary transfer) to a hospital capable of PCI (adults) or with a PICU (pediatrics)	Yes, primary hospital/yes, secondary hospital/no/unknown/not recorded
Process postresuscitation supplemental		
Hospital volume	Number of cases of OHCA treated at the primary treating hospital per year	Number of cases per year
12-lead ECG interpretation	Interpretation of first 12-lead ECG	STEMI/ischemic changes (not STEMI)/new LBBB/normal/other/not performed
Temperature control	Temperature control strategy to maintain a specific temperature: Hypothermic temperature control is active temperature control with the target temperature below the normal range. Normothermic temperature control is active temperature control with the target temperature in the normal range. Fever temperature control is the monitoring of temperature and actively preventing and treating temperature above the normal range. No temperature control is no protocolized active temperature control strategy.	Hypothermic temperature control/normothermic temperature control/fever prevention temperature control/no temperature control/unknown/not recorded
Postarrest pyrexia	Patient temperature >37.7°C within 72 h of cardiac arrest Date and time first pyrexia documented	Yes/no/unknown/not recorded Date and time of first pyrexia
Mechanical circulatory support after ROSC	Use of mechanical circulatory support after ROSC	ECMO/IABP/LVAD/other (name)/unknown/not recorded
Vasopressors or inotropes	Use of vasopressors or inotrope infusions in first 72 h (type)	Yes/no/unknown Specify vasopressor/inotrope
Neuroprognostic tests	Number and type of neuroprognostic tests used	SSEP: Yes/no/unknown/not recorded NSE: Yes/no/unknown/not recorded EEG: Yes/no/unknown/not recorded CT of brain: Yes/no/unknown/not recorded MRI of brain: Yes/no/unknown/not recorded Clinical examination: Yes/no/unknown/not recorded Other (define): Yes/no/unknown/not recorded Indicate timing of test and whether test led to discontinuation of treatment.
Outcome core		
Survived event	ROSC sustained until arrival at the emergency department and transfer of care to medical staff at the receiving hospital If there is ROC supported by prehospital extracorporeal CPR, this should be reported separately (yes ROSC/yes ROC/no/unknown/not recorded)	Yes/no/unknown/not recorded
Any ROSC	ROSC at any point during the resuscitation attempt	Yes/no/unknown/not recorded
Transported to hospital	Transported to a hospital for treatment	Yes/no/unknown/not recorded
Survival to discharge or 30 d	Alive at the point of hospital discharge/30 d If transported to another hospital for treatment and outcome is unknown, survival should be recorded as unknown.	Yes/no/unknown/not recorded
Neurological outcome at discharge or 30 d	Record CPC and/or mRS score in adults and PedsQL scales in pediatrics at hospital discharge or 30 d Include a definition of how it was measured (face to face, extracted from notes, combination)	Adults: CPC score (1–5)/unknown/not recorded or mRS score (0–6)/unknown/not recorded Pediatrics: PedsQL score/unknown/not recorded
Outcome supplemental		
Scene outcome	Patient's condition at the time of EMS leaving the scene	ROSC/CPR in progress/deceased/unknown/not recorded
Hospital arrival outcome	Patient's condition at the time of arrival at first hospital	ROSC/CPR in progress/deceased/not transported/unknown/not recorded
Treatment withdrawal	Timing from ROSC to decision to withdraw lifesaving treatment	Hours/no WLST/unknown/not recorded
Context of death	Context of patient's death as per medical records	Termination of resuscitation/rearrest with DNR/neurological WLST/nonneurological WLST/other/unknown/not recorded

(*Continued*)

Table 2. Continued

Utstein OHCA item	Consensus definition 2024	Data options
Date and time of death	If the patient dies, date and time of death	Date, time
Organ donation	≥1 solid organs donated for transplantation	Yes/no unknown/not recorded
Survival status after discharge	Patient is alive after hospital discharge and timing (eg, 90 d, 12 mo)	Yes/no/unknown/not recorded Timing
Health-related quality of life	Results of a validated health-related quality of life measure. Tools recommended for adults are the Health Utilities Index (version 3), Short-Form 36-Item Health Survey, and the EuroQol EQ-5D-5L. Tool recommended for children is the PedsQL Scales.	Scores/unknown/not recorded

AED indicates automated external defibrillator; AHA, American Heart Association; AICD, automatic implantable cardioverter defibrillator; app, application; BP, blood pressure; CABG, coronary artery bypass graft; CCI, Charlson Comorbidity Index; CPC, Cerebral Performance Category; CPR, cardiopulmonary resuscitation; CT, computed tomography; DNACPR, do not attempt cardiopulmonary resuscitation; DNR, do not resuscitate; ECMO, extracorporeal membrane oxygenation; EEG, electroencephalogram; EMS, emergency medical services; ERC, European Research Council; IABP, intra-aortic balloon pump; LBBB, left bundle-branch block; LVAD, left ventricular assist device; MRI, magnetic resonance imaging; mRS, modified Rankin Score; NSE, neuron-specific enolase; OHCA, out-of-hospital cardiac arrest; PCI, percutaneous corona\ry intervention; PEA, pulseless electrical activity; PedsQL, Pediatric Quality of Life Inventory; PICU, pediatric intensive care unit; PSAP, public-safety answering point; ROC, return of circulation; ROSC, return of spontaneous circulation; SSEP, somatosensory evoked potential; STEMI, ST-segment–elevation myocardial infarction; SUID, sudden unexpected infant death; VAD, ventricular assist device; VF, ventricular fibrillation; VT, ventricular tachycardia; and WLST, withdrawal of lifesaving treatment.

*EMS responders are dispatched as part of the emergency response and belong to an organization with the ability to transport patients (eg, paramedics, emergency medical technicians); first responders are dispatched as part of the emergency response but are part of an organization that does not have the ability to transport patients (eg, typically fire and police); dispatched responders include EMS and first responders; and volunteer community responders are those alerted to the scene but who have a choice as to whether they attend (eg, volunteers alerted by a smartphone app).

Knowledge of where cardiac arrests occur can benefit communities and EMS in optimizing their resources. A basic list of predefined arrest locations facilitates comparisons. We have added the location data options of health and medical centers because they were widely collected and reported by registries. For a more comprehensive analysis, we propose including a detailed location field (supplemental), which will enable data linkage to population datasets such as census data and facilitate geospatial analysis. To ensure privacy and confidentiality, this information can be stored in a deidentifiable format. For instance, X and Y location coordinates can be truncated to reflect an area rather than an exact location or can be stored as census tracts.

Bystander response plays a critical role in OHCA outcomes.[46] To improve our understanding and evaluation of bystander response, bystander CPR and bystander automated external defibrillator use are now distinctly separated. Improvements made to terminology and data collection are intended to provide insights into the effectiveness of bystander interventions.

As currently defined, bystander CPR refers to CPR (chest compressions with or without ventilation) performed by individuals present at the scene or called/alerted to the scene, which may include volunteer community responders and off-duty health care professionals. It is important to note that bystander CPR and bystander automated external defibrillator use should exclude first responders dispatched as part of the emergency response such as fire and police.

To enable the assessment of system effectiveness, additional supplemental items have been introduced to identify the specific individuals who provided CPR first and who provided defibrillation first. Volunteer community responders have been separated from on-scene bystanders for these items to facilitate evaluations of these programs.

Another significant discussion point was the 2015 Utstein changes to pathogenesis, also referred to as presumed cause or etiology, which saw the replacement of the subgroup of presumed cardiac etiology[4,5] with presumed medical etiology.[6,7] This adjustment is supported by studies that have examined hospital and autopsy records, which suggest that an underlying cardiac cause is seen in only 30% to 60% of nontraumatic OHCAs.[47–51] To facilitate monitoring and research in patients with specific presumed causes of their cardiac arrest, subgroups are now available as supplemental data options. This approach aims to provide a more comprehensive

Table 3. Examples of System Description

Population: Size of the population and region served, unique characteristics of population (eg, younger than the national average, living in metropolitan or rural areas), case ascertainment
Dispatch: Dispatch system used, emergency response for OHCA, use and type of telephone CPR instructions, alert or dispatch of volunteer community and first responders, and technology used (eg, first responder activation apps, video assistance, artificial intelligence, AED registry in dispatch)
EMS: Number of EMS calls, number and skill set of EMS providers (eg, basic or advanced life support, EMT/paramedic/physician), resuscitation council guidelines followed and any variations, resuscitation attempted and termination protocols, other emergency care included in attempted resuscitation, use of high-performance CPR and CPR quality feedback, capability for 12-lead ECG, targeted blood pressure, oxygenation and ventilation practices, transport policies, and use of an OHCA registry
Hospitals: Availability of postresuscitation care (eg, PCI/PICU)

AED indicates automated external defibrillator; app, application; CPR, cardiopulmonary resuscitation; EMS, emergency medical services; EMT, emergency medical technician; OHCA, out-of-hospital cardiac arrest; PCI, percutaneous coronary intervention; and PICU, pediatric intensive care unit.

understanding of OHCA incidents, enabling the study of outcomes within these subgroups.[52–54]

Additional supplemental items include comorbidities and prior functioning (ie, independent living). Evidence of the impact of premorbid state of health and comorbidities on OHCA outcomes varies widely across OHCA research,[55,56] perhaps because of variation in the measurements used. We recommend standardization of this data collection with validated tools such as the Charlson Comorbidity Index[57] or tools that are used to measure outcomes to enable premorbid adjustment (eg, modified Rankin Scale [mRS][58] or Cerebral Performance Category [CPC][59]). The collection of known risk factors (eg, cardiovascular) and preexisting medical conditions (eg, asthma, cancer) may be important to facilitate the comparison of groups in research examining the effectiveness of interventions.

Process

Intra-Arrest

Survival after cardiac arrest is dependent on response times and the duration of the arrest. This update expands the time points recommended in 2015 Utstein template because many of these are routinely collected by registries and researchers. A list of core times from arrest to hospital is now provided to facilitate the calculation of core and supplemental time intervals. This list also includes supplemental time points to estimate the duration of arrest, which may be important for statistical adjustment in observational research examining the impact of intra-arrest or postarrest interventions.[60]

Modifications have been made to items that include time intervals because they are known to differ as a result of regional variations in access to data. For example, the starting point for these times could be the time of the arrest, the time the call is received (typically by asking, "What is your emergency?") at the primary public-safety answering point, or the time the call is transferred to another agency for EMS (secondary public-safety answering point).[24] The new definition enables some flexibility across various time intervals. However, compliance with the gold standard (described later) is recommended. A description of all time points used must be included in reporting and research to enable system comparisons.

The gold standard intervals are the times between the connection of the call to a public-safety answering point ("What is your emergency?") and the time the EMS arrives on the scene (core, response time); the time to first compression, regardless of who delivers it (supplemental, time to first compression); and the time to first defibrillation, regardless of who delivers it (supplemental, time to first defibrillation). The time the primary public-safety answering point answers the call is more accurate than the actual system response time. The interval to transfer to the secondary public-safety answering point can be long in many systems and contribute to delays. In systems that can collect it, this is valuable information. Alternative time options to these gold standards are provided in Table 2. It is notable that some of these times may be a negative value if CPR or defibrillation is started before the emergency call is made. The handling of negative values when reporting these times may vary, depending on the purpose. For example, these negative values should be excluded in examinations of time to dispatcher CPR because CPR is already underway but could be made zero if time to first CPR is being reported and explained in reporting. When these times are used, we recommend reporting how many had prior CPR or defibrillation.

We have also added new variables, notably who provided the first compression and the first defibrillation, because it may be important to differentiate who was first on the scene and provided CPR and defibrillation in assessments of system effectiveness (eg, first responder and public-access defibrillation programs).[61]

Postresuscitation

Definitions and coding of some elements of postresuscitation care have been updated to reflect changes in treatment recommendations and to align with the 2019 in-hospital cardiac arrest (IHCA) Utstein template.[21,22] The writing group recognizes that EMS-based registries may find it difficult to include postresuscitation care data, but this template aims to include the whole patient pathway for OHCA, any part of which may affect patient outcome. These data are likely to be collected by hospital-based registries and for research. Additional items can be found in the 2019 IHCA[21,22] Utstein publications (Table 1), but it should be noted that some items may not reflect current treatment recommendations.

The presence of ST-segment–elevation myocardial infarction has been moved from the patient domain. Coronary angiography and reperfusion attempted are retained but are now split into 2 variables to align with the 2019 IHCA Utstein template, and the timing in the data options has been redefined to reflect the current ILCOR recommendations.[20,62,63] The split between urgent and early was included because the evidence for timing remains of low certainty.[64] The precise timing of angiography and timing of reperfusion are supplemental.

There is growing evidence that transportation to specialty hospitals is associated with improved outcomes,[65–67] although this may be limited to certain patient groups[68] and may not apply to all health care systems.[68] Current evidence suggests that this includes hospitals capable of 24-hour coronary reperfusion in adults[65] and hospitals with a pediatric intensive care unit in children.[66] Given the importance of this item for outcomes, hospital type is now included as core.

Numerous supplemental items from the 2015 Utstein template[6,7] have been removed because single measurements are of limited value (eg, pH, lactate, and glucose)

and may vary over time (blood pressure, oxygenation, and ventilation parameters). Hospital volume and neuroprognostic testing are unchanged from the 2015 Utstein. Other variables have been redefined or combined. A new variable, mechanical circulatory support after ROSC, includes the options of extracorporeal membrane oxygenation, ventricular assist devices (including transvalvular microaxial flow pump devices), and intraaortic balloon pump. Interpretation of the first 12-lead ECG replaces whether one was performed. Temperature control (formerly targeted temperature management) is now recommended only after ROSC,[62,63] so it has been moved to the process postresuscitation domain. This item has been renamed temperature control and redefined to reflect the recommendations of the Advanced Life Support Task Force of ILCOR.[62,63] A new item determining whether there was postarrest pyrexia within 72 hours has been added as supplemental to align with the 2019 IHCA Utstein template.[21,22]

Outcomes

The writing group considered the core items identified in the ILCOR COSCA (Core Outcomes Set for Cardiac Arrest) publications for clinical trials in adults[30,31] and children.[32,33] The outcomes of survived event, any ROSC, and survival to hospital discharge or 30 days remain unchanged and core in this update (Table 2). ROSC continues to be defined as the return of spontaneous circulation (ie, pulse or blood pressure) that is patient generated and not assisted (eg, with extracorporeal membrane oxygenation). The definition of survived event remains unchanged, but if return of circulation (ROC) supported by prehospital extracorporeal CPR occurs, it is recommended that ROSC and ROC be reported separately for survived event (Table 1). Whether a time frame for sustained ROSC (eg, >20 minutes) should be provided was discussed briefly. However, the addition of time may not cover all possible situations (eg, an EMS-witnessed arrest with ROSC that occurs <20 minutes from the hospital). There were also concerns about backward compatibility with any change. Survival to hospital discharge and survival to 30 days may not be interchangeable or combined without a regional comparison to ensure comparability[70] because these outcomes can be affected by regional differences in patients discharged home for palliation.[30,31] Survival to 30 days includes the patient status at the end of the 30th day. The transported to hospital item has been upgraded from supplemental item to core item because it has important resource and clinical implications.

The 2015 Utstein template recommends collecting neurological outcomes at hospital discharge or 30 days with the CPC or mRS or a pediatric equivalent. Changes to this item are based on the COSCA recommendations that the Pediatric CPC be used for children,[32,33] measurement can occur at discharge or 30 days,[30–33] and reporting should include all categories rather than simply reporting favorable (eg, CPC score 1–2 or mRS score 0–3) or unfavorable (eg, CPC score 3–5 or mRS score 4–6) outcomes.[30–33] In adults, it is recommended that neurological outcomes be collected by the mRS or CPC. Registries and researchers should be aware that the mRS and CPC are not interchangeable for good neurological outcomes (eg, CPC score 1–2 or mRS score 0–3),[71] and discharge disposition is not a good proxy measure of neurological outcomes.[71]

Two new supplemental variables describe the patient's status on departure from the scene of the cardiac arrest (scene outcome) and on arrival at the first treating hospital (hospital arrival outcome). These variables are widely collected by registries, using the data options provided in Table 2, and are important for monitoring outcomes and for research into treatments of refractory arrest such as extracorporeal CPR. Treatment withdrawal has been revised to align with the 2019 IHCA Utstein template[21,22] and to provide context to the circumstance of the patient's death (context of death): termination of resuscitation, rearrest with a do-not-resuscitate decision in place, or withdrawal of life-sustaining treatment for neurological or nonneurological (eg, refractory hemodynamic shock, multiorgan or respiratory failure) reasons. The inclusion of additional organ donation variables, as recommended in the 2023 ILCOR organ donation after OHCA scientific statement,[34,35] was discussed at length. The OHCA writing group decided to retain the single organ donation item and to refer those interested in collecting additional data to the ILCOR statement (Table 1).[34,35]

Patient-reported outcome measures are increasingly important, and a specific patient-reported outcome measure for cardiac arrest survivors is being developed.[72] The COSCA group also recommends that health-related quality of life be measured with ≥1 tools at 90 days and at periodic intervals up to 12 months after cardiac arrest, if resources allow.[30–33] Recommended tools for adults are the Health Utilities Index (version 3), Short-Form 36-Item Health Survey, and the EuroQol EQ-5D-5L.[30,31] Tools recommended for children are the Pediatric Quality of Life Inventory Scales, which differ for infants (<2 years of age) and older children (2–18 years of age).[32,33] Because of the extensive resources needed for this collection, health-related quality-of-life measures remain supplemental outcomes in this update. The recommended times for collecting these data are now flexible, in line with recommendations made by the COSCA group.

Special Circumstances

OHCA occurring in special circumstances may require additional data collection. Data collection for these circumstances is beyond the scope of this scientific statement, and we refer researchers interested in these groups to the documents in Table 1.

Developing-EMS and Low-Resource Settings

The current Utstein template applies to developed or mature EMS systems, where the majority of OHCAs are attended by EMS personnel. However, in countries with developing EMS systems, up to 80% of patients with OHCA may bypass the EMS and be transported in personal vehicles to hospitals.[9,73] This behavior is shaped by both the availability and the maturity of the EMS, as well as by sociocultural reasons. In addition, many elements of the chain of survival[74,75] may be missing in these countries or are still underdeveloped. Existing OHCA data collection from such regions is heterogeneous, with Utstein-style reporting rarely used.[76] Nonetheless, reporting OHCA data from these systems is important for OHCA surveillance, audit, and quality improvement initiatives; identification of gaps in the system; and research. To improve use, the existing template can now be adapted for these systems in which data collection may start in the hospital and there are significant competing health priorities. To make the data collection more applicable and less onerous, we propose a minimum dataset for low-resource settings (Supplemental Material 1 Table S3).

Neonates

The resuscitation and treatment of neonates (ie, newborns immediately after birth[20]) in cardiac arrest are different from those for other newborns, older children, and adults.[77,78] Data collection for neonatal OHCAs should adopt the Neonatal Utstein template.[20]

Pediatrics

Pediatric OHCA is rarer than adult OHCA, with the global incidence estimated at 8 cases per 100 000 children but with significant regional variation.[79] Overall, the survival of children is comparable to that of adults, although this varies across pediatric age groups.[80–82] The most frequent causes of OHCA in children are sudden unexpected infant death and accidental deaths (eg, drowning).[83,84] The underlying cause of pediatric OHCA can be difficult to determine in the prehospital setting.[83,85] The management of OHCA has the same components, although there is a greater emphasis on ventilation.[86–88] The Utstein OHCA variables that generated a separate pediatric consideration were age categories, hospital type, and cause. Age categories should be reported consistently across all regions. To maintain consistency with previous studies and child developmental stages, we recommend that age be categorized as <1, 1 to 5, 6 to 11, and 12 to <18 years.[81,82] Transport to a cardiac arrest center is not relevant for most pediatric OHCAs. Instead, we recommend documentation of whether the child was transported to a pediatric intensive care unit.[66] Last, for cause, we suggest a subgroup of sudden unexpected infant death.[89]

Utstein Reporting

The 2015 Utstein template[6,7] used a large flowchart, including all core variables, to provide a framework for reporting. However, our review found little evidence of its use in registries reporting reports or research.

To aid reporting and visualization of data for reporting purposes, we have created 2 new flowcharts containing the key core data points and aiming to measure system effectiveness in all EMS-resuscitated cases and system efficacy in the Utstein comparator group (Figures 2 and 3). Usable versions are provided in Supplemental Material 2 Figures S1 and S2. These flowcharts are intended to provide guidance for the reporting of OHCA populations and may require changes to detail important subgroups (eg, adults/children, nontraumatic/traumatic, EMS witnessed/not EMS witnessed).

Our review uncovered variations in case ascertainment, variations in case inclusions/exclusions, and variable definitions across registries and research. All variations of this Utstein template, methods for case ascertainment, and quality assurance should be clearly documented when OHCA data are reported to facilitate comparisons. We also provide a list of exemplars of regional, national, and international OHCA registries with links to their annual reports (Supplemental Material 1 Table S1).

Incidence Rates

We recommend the reporting of crude and age-standardized OHCA incidence using World Health Organization population standards. There is also a growing trend to report survival as an incidence rate.[90]

Utstein Comparator Group

The Utstein comparator group is used to assess system efficacy (Figure 3). This group is defined as bystander-witnessed OHCA cases with an initial shockable rhythm that received an attempted resuscitation.[6,7] However, our review found that the definitions used when these data are reported by some registries vary slightly. It is currently unclear how much this variation affects reported outcomes, although, because most of these cases are adults of a presumed nontraumatic cause, the effect is likely to be minor. The inclusion or exclusion of additional criteria should be clearly documented to enable comparisons across systems.

Use of Risk-Adjustment Methods

Risk adjustment is the statistical process that accounts for patient characteristics and clinical conditions (ie, patient case mix) that are known to affect outcomes. This adjustment is necessary when comparing the performance of health care services (eg, EMS or hospitals) with each other and over time.[91,92] In the context of OHCA, risk adjustment for widely available core Utstein factors (eg, age, sex, location of arrest, witnessed status, bystander CPR, initial monitored rhythm, EMS response times) explains ≈50% of the variation between EMS for survival to discharge or 30 days.[93–95] The variation explained by

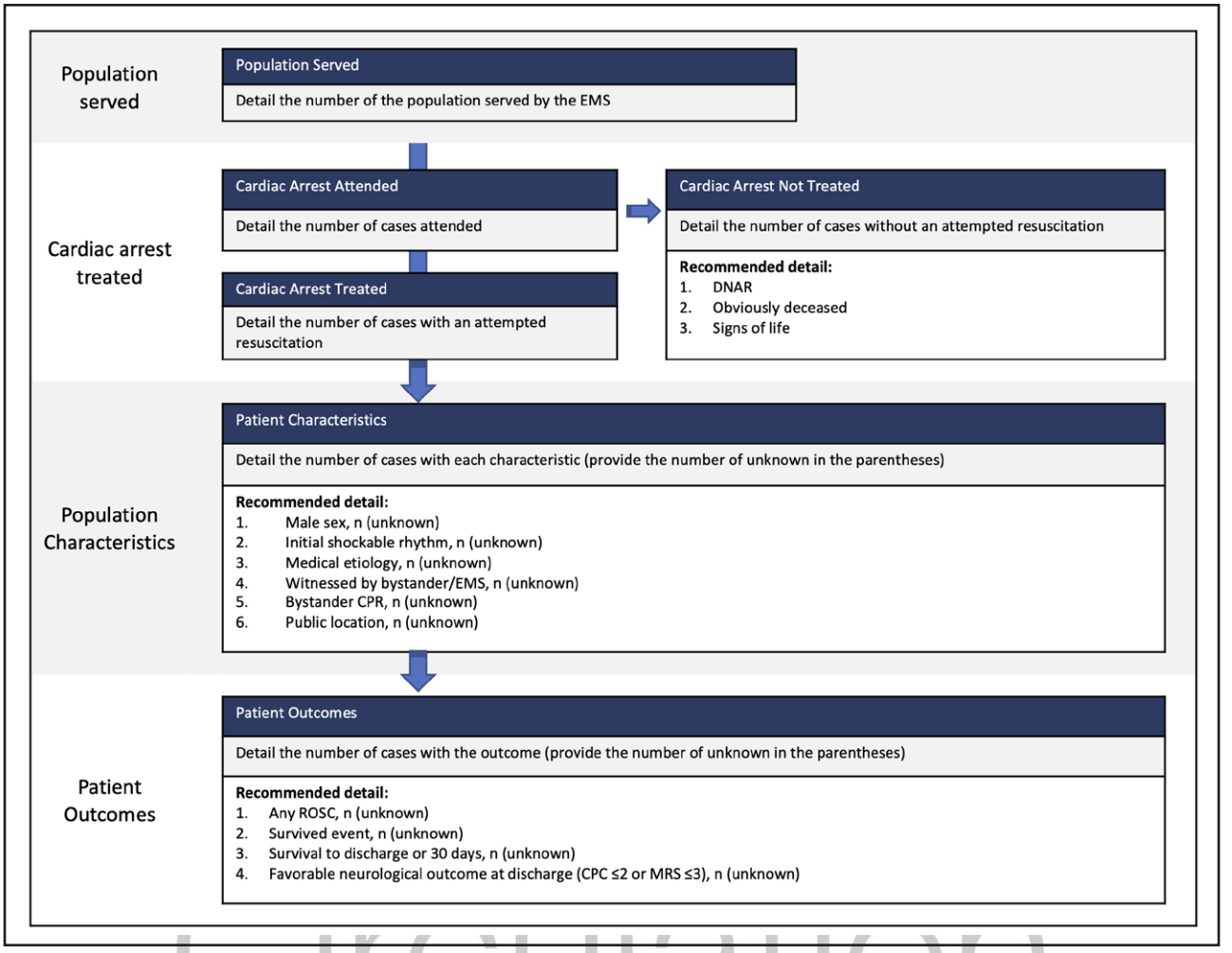

Figure 2. Utstein OHCA flowchart for system effectiveness (attempted resuscitation).
CPC indicates Cerebral Performance Category; CPR, cardiopulmonary resuscitation; DNAR, do not attempt resuscitation; EMS, emergency medical services; mRS, modified Rankin Scale; OHCA, out-of-hospital cardiac arrest; and ROSC, return of spontaneous circulation.

these factors for event survival is much lower (≈28%[93]), which highlights that one risk-adjusted model may not perform well for all outcomes. However, risk adjustment is essential and recommended for accurate comparisons between health services, for the evaluation of quality improvement programs,[96,97] and to study the effectiveness of interventions.[98,99] We also encourage researchers who are planning observational resuscitation research of interventions to consider the impact of the resuscitation time bias (ie, interventions occurring later during resuscitation will tend to be associated with a worse outcome).[60]

Missing Data

The amount of missing data and the methods for dealing with missing data should be reported in all publications and research. We recommend providing a supplementary table describing missing data in all reporting. Methods for handling missing data need to consider the advantages and disadvantages of different approaches.[100] We recommend that registries use methods to identify whether specific cases have missing data[101] and aim to improve data collection in these groups.

Research Checklist

We encourage researchers to use the appropriate reporting checklist when writing their manuscripts (https://www.equator-network.org). To assist researchers with the standardization of reporting, we have included an OHCA Utstein checklist (Supplemental Material 1 Table S4) in the manner of existing checklists for reporting. We encourage journal editors who are publishing OHCA studies to include this checklist in their guidance to authors.

FUTURE DIRECTIONS

Automation and Data Linkage

The automation and integration of data collection processes hold significant potential for enhancing the collection and analysis of cardiac arrest data. The

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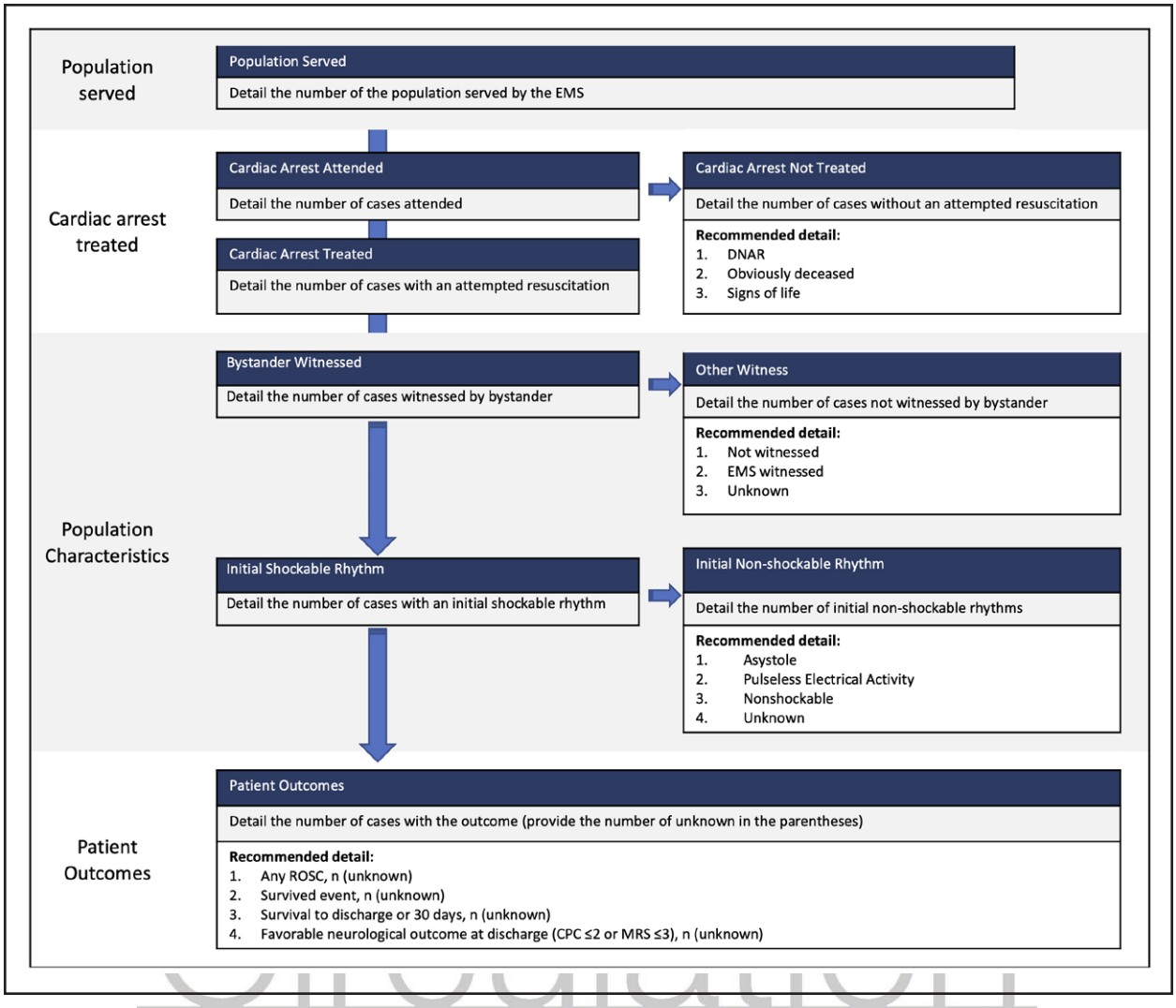

Figure 3. Utstein OHCA flowchart for system efficacy (Utstein comparator).
CPC indicates Cerebral Performance Category; DNAR, do not attempt resuscitation; EMS, emergency medical services; mRS, modified Rankin Scale; OHCA, out-of-hospital cardiac arrest; and ROSC, return of spontaneous circulation.

standardization and quality of data may be greatly improved by automating data collection and integrating information from other sources. However, the progress of automation initiatives has been impeded by legal and regulatory restrictions governing the storage and sharing of personally identifiable patient data. These constraints create obstacles in accessing data for research and quality enhancement purposes. Another hurdle lies in harmonizing variables across different platforms, achieved through data linkage with a unique identifier. Given the diversity of the electronic systems collecting cardiac arrest data, this linkage process presents its own set of challenges. Urgent attention should be directed toward advancing technological solutions that address and enhance this data linkage issue. Machine learning holds great promise for reducing errors in data collection[102] and for data linkage.[103]

The ILCOR Global OHCA Reports

Over the past decade, there has been a notable increase in the establishment of national and regional OHCA registries. A central objective of the ILCOR Research and Registry Committee has been to foster collaboration among these registries to report the first global OHCA data. This was first achieved in 2020, with 7 national and 4 regional registries contributing data to the landmark first global report on OHCA.[12] Subsequently, in 2023, a follow-up publication expanded data collection to 11 national and 4 regional registries and spanning multiple years.[13] This report examined temporal trends, revealing a notable increase in bystander CPR in most regions and, in some regions, an improvement in survival. Evident in both articles are salient regional variations in OHCA incidence, patients, arrest characteristics, care, and outcomes.

It is intended that this collaboration will continue and extend to regions not currently participating. The overarching goal is to increase the network of registry collaboration, facilitating the exchange of knowledge and best practices. By harnessing the power of shared insights, this effort seeks to create a global impact by enhancing the quality of OHCA care and ultimately saving more lives.

CONCLUSIONS

Detailed descriptions of health services, data sources, and definitions are essential to ensure accurate outcome comparisons. Variations in practices, policies, and definitions can lead to divergent outcomes between registries and studies. Accurate and detailed reporting of this information is crucial for informing the ILCOR treatment recommendations and enhancing health service delivery. Even in registries using the Utstein template, there is still significant variation between registries. This variation is seen in case inclusion criteria, variable definitions, coding, and reporting.

Utstein-style guidelines aim to standardize reporting of the process of care and outcomes for patients with cardiac arrest. Through an international modified Delphi consensus process, the 2015 Utstein template[6,7] for OHCA reporting definitions and data options has been updated. New or modified elements reflect changes in practice and systems of care, with consideration of backward compatibility and different levels of registry sophistication. Two new flowcharts will aid research for system effectiveness and system efficacy, and a checklist is provided to improve reporting and transparency.

ARTICLE INFORMATION

The American Heart Association, the European Resuscitation Council, and the International Liaison Committee on Resuscitation make every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

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Contributions

Dr Bray created and conducted the Delphi surveys and prepared the first draft of the manuscript with Dr Grasner. Drs Perkins, Finn, Ong, and Nolan ran the domain subgroup meetings. Drs Bray and Doherty conducted the review of citing publications and major registry annual reports. Dr Nehme drafted the reporting flowcharts. All authors and nonauthor collaborators participated in the modified Delphi process and provided intellectual input into the manuscript.

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Disclosures

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(*Continued*)

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This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $5000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $5000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

Reviewer Disclosures

Reviewer	Employment	Research grant	Other research support	Speakers' bureau/ honoraria	Expert witness	Ownership interest	Consultant/ advisory board	Other
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Michael Kurz	University of Chicago	None	None	None	None	None	None	None
Siobhan Masterson	Irish National Ambulance Service (Ireland)	None	None	None	None	None	None	ILCOR and EuReCA (I am a member of the ILCOR BLS Task Force and a member of the EuReCA Study Management Team)*
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Theresa M. Olasveengen	Oslo University Hospital and University of Oslo (Norway)	None	None	None	None	None	Laerdal Foundation*	None

This table represents the relationships of reviewers that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all reviewers are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $5000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $5000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

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