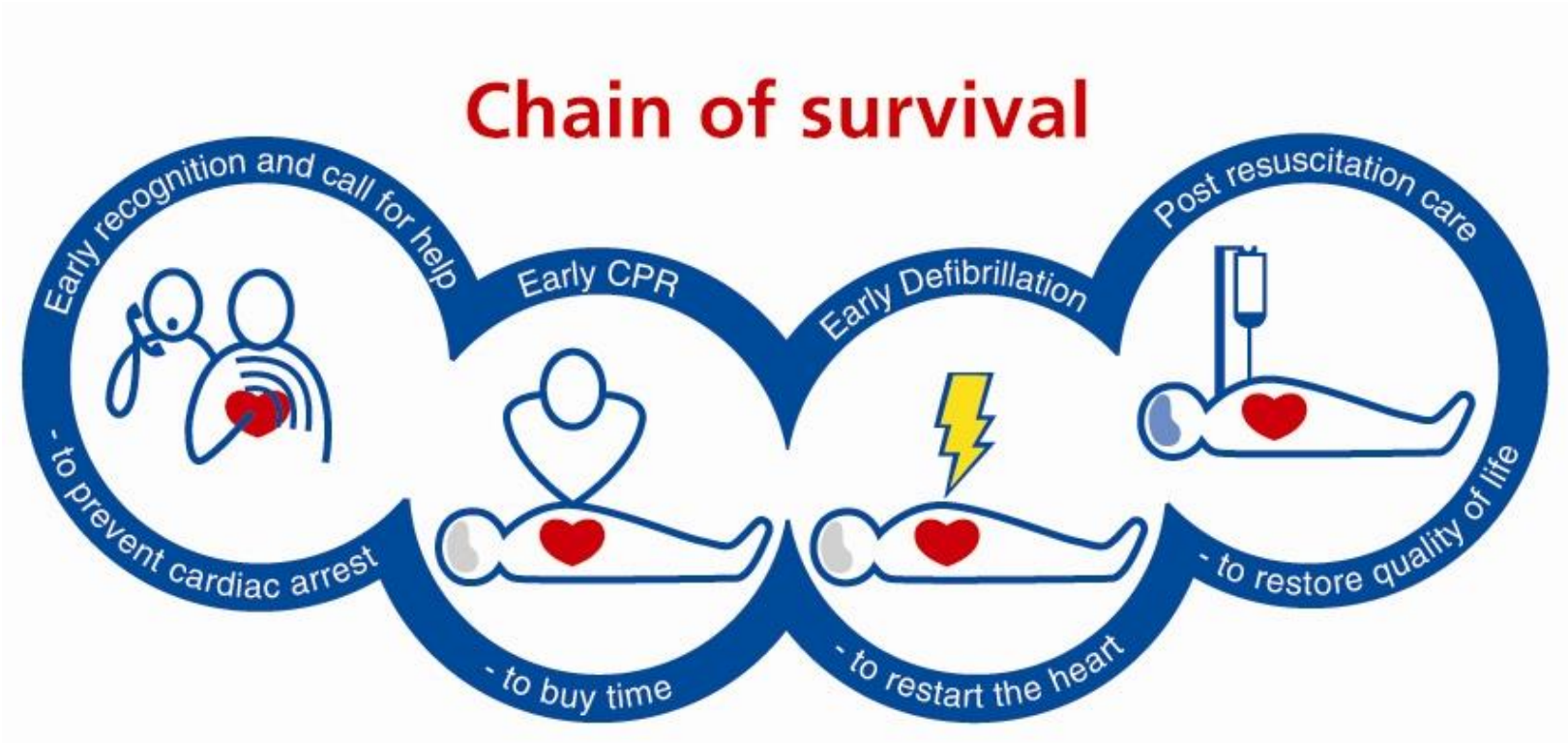
Causes and Prevention of Cardiac Arrest

Learning outcomes

- The importance of early recognition of the deteriorating patient
- The causes of cardiac arrest in adults
- Identify and treat patients at risk of cardiac arrest using the ABCDE approach

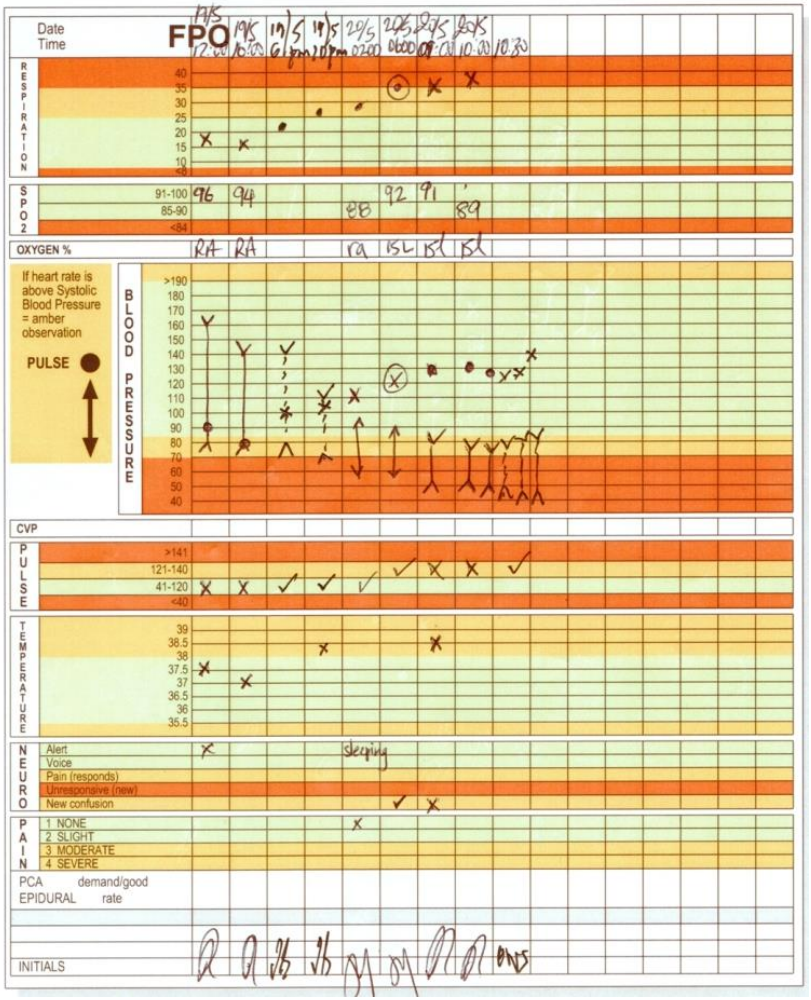


Early recognition prevents:

- Cardiac arrests and deaths
- Admissions to ICU
- Inappropriate resuscitation attempts

Early recognition of the deteriorating patient

- Most arrests are predictable
- Deterioration prior to 50 - 80% of cardiac arrests
- Hypoxia and hypotension are common antecedents
- Delays in referral to higher levels of care



Outcome after in-hospital cardiac arrest (UK)

	VF/VT	Non-VF/VT
Number of patients	570 (18%)	2,614 (82%)
ROSC > 20 min	385 (68%)	689 (26%)
Survival to hospital discharge	251 (44%)	179 (7%)

- Source: National Cardiac Arrest Audit (NCAA) 2010
- Based on 3,184 **adults** (aged ≥ 16 y) in 61 hospitals participating in NCAA (increasing numbers of hospitals during Oct 2009 to Oct 2010) with known presenting/first documented rhythm and complete data for ROSC and survival to hospital discharge. All these individuals received chest compressions and/or defibrillation from the resuscitation team in response to a 2222 call. Many in-hospital cardiac arrests do not fulfil these criteria and are not included here.
- For full definitions, see NCAA Dataset Specification

ncaa

Supported by Resuscitation Council (UK) and ICNARC

ALS Resuscitation Council (UK)

Chart 1: The NEWS scoring system

Physiological parameter	Score 3	2	1	0	1	2	3
Respiration rate (per minute)	≤8		9–11	12–20		21–24	≥25
SpO_2 Scale 1 (%)	≤91	92–93	94–95	≥96			
SpO_2 Scale 2 (%)	≤83	84–85	86–87	88–92 ≥93 on air	93–94 on oxygen	95–96 on oxygen	≥97 on oxygen
Air or oxygen?		Oxygen		Air			
Systolic blood pressure (mmHg)	≤90	91–100	101–110	111–219			≥220
Pulse (per minute)	≤40		41–50	51–90	91–110	111–130	≥131
Consciousness				Alert			CVPU
Temperature (°C)	≤35.0		35.1–36.0	36.1–38.0	38.1–39.0	≥39.1	

Chart 2: NEWS thresholds and triggers

NEW score	Clinical risk	Response
Aggregate score 0–4	Low	Ward-based response
Red score Score of 3 in any individual parameter	Low–medium	Urgent ward-based response*
Aggregate score 5–6	Medium	Key threshold for urgent response*
Aggregate score 7 or more	High	Urgent or emergency response**

* Response by a clinician or team with competence in the assessment and treatment of acutely ill patients and in recognising when the escalation of care to a critical care team is appropriate.

**The response team must also include staff with critical care skills, including airway management.

The ABCDE approach to the deteriorating patient

Airway

Breathing

Circulation

Disability

Exposure

ABCDE approach

Underlying principles:

- Complete initial assessment
- Treat life-threatening problems
- Reassessment
- Assess effects of treatment/interventions
- Call for help early

ABCDE approach

- Personal safety
- Patient responsiveness
- First impression
- Vital signs
  - Respiratory rate, SpO_2, pulse, BP, GCS, temperature

ABCDE approach
Airway

Causes of airway obstruction:

- CNS depression
- Blood
- Vomit
- Foreign body
- Trauma
- Infection
- Inflammation
- Laryngospasm
- Bronchospasm

ABCDE approach
Airway

Recognition of airway obstruction:

- Talking
- Difficulty breathing, distressed, choking
- Shortness of breath
- Noisy breathing
  - Stridor, wheeze, gurgling
- See-saw respiratory pattern, accessory muscles

ABCDE approach
Airway

Treatment of airway obstruction:

- Airway opening
  - Head tilt, chin lift, jaw thrust
- Simple adjuncts (simple devices: oral airway, nasal airway)
- Advanced techniques
  - e.g. LMA, tracheal tube
- Oxygen

ABCDE approach
Breathing

Causes of breathing problems:

- Decreased respiratory drive
  - CNS depression
- Decreased respiratory effort
  - Muscle weakness
  - Nerve damage
  - Restrictive chest defect
  - Pain from fractured ribs
- Lung disorders
  - Pneumothorax
  - Haemothorax
  - Infection
  - Acute exacerbation COPD
  - Asthma
  - Pulmonary embolus
  - ARDS

ABCDE approach
Breathing

Recognition of breathing problems:

- Look
  - Respiratory distress, accessory muscles, cyanosis, respiratory rate, chest deformity, conscious level
- Listen
  - Noisy breathing, breath sounds
- Feel
  - Expansion, percussion, tracheal position

ABCDE approach
Breathing

Treatment of breathing problems:

- Airway
- Oxygen
- Treat underlying cause
  - e.g. drain pneumothorax
- Support breathing if inadequate
  - e.g. ventilate with bag-mask

ABCDE approach
Circulation

Causes of circulation problems:

- Primary
  - Acute coronary syndromes
  - Arrhythmias
  - Hypertensive heart disease
  - Valve disease
  - Drugs
  - Hereditary cardiac diseases
  - Electrolyte/acid base abnormalities
- Secondary
  - Asphyxia
  - Hypoxaemia
  - Blood loss
  - Hypothermia
  - Septic shock

ABCDE approach
Circulation

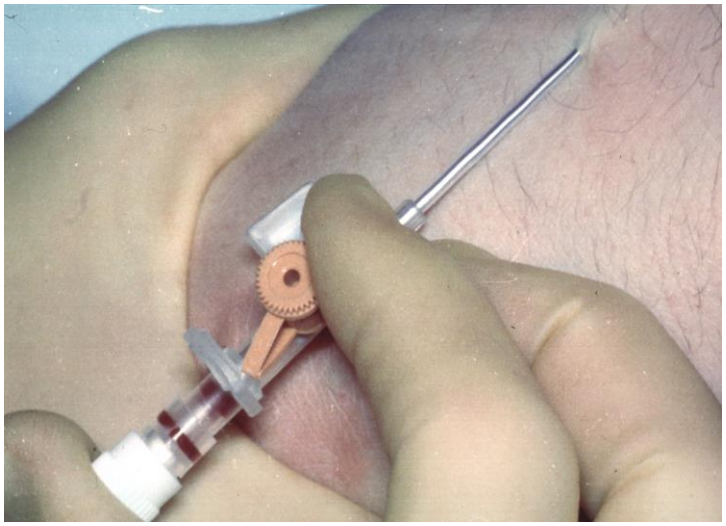
Recognition of circulation problems:

- Look at the patient
- Pulse - tachycardia, bradycardia
- Peripheral perfusion - capillary refill time
- Blood pressure
- Organ perfusion
  - Chest pain, mental state, urine output
- Bleeding, fluid losses

ABCDE approach
Circulation

Treatment of circulation problems:

- Airway, Breathing
- Oxygen
- IV/IO access, take bloods
- Treat cause
- Fluid challenge
- Haemodynamic monitoring
- Inotropes/vasopressors
- Aspirin/nitrates/oxygen (if appropriate) and morphine for acute coronary syndrome



ABCDE approach
Disability

Recognition

- AVPU or GCS
- Pupils

Treatment

- ABC
- Treat underlying cause
- Blood glucose
  - If < 4 mmol l^{-1} give glucose
- Consider lateral position
- Check drug chart

ABCDE approach
Exposure

- Remove clothes to enable examination
  - e.g. injuries, bleeding, rashes
- Avoid heat loss
- Maintain dignity

Any questions?

Summary

- Early recognition of the deteriorating patient may prevent cardiac arrest
- Most patients have warning symptoms and signs before cardiac arrest
- Airway, breathing or circulation problems can cause cardiac arrest
- ABCDE approach to recognise and treat patients at risk of cardiac arrest

Advanced Life Support Course
Slide set