VIEWPOINT

Complexity of prehospital nursing care: reflections on a case

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Introduction

Prehospital medical practice is often particularly complex for several reasons. These include: situations of vital emergency requiring immediate, accurate and effective action, attending the patient's family, working in a "hostile" environment in public or in confined spaces, being part of health care team that is limited to a nurse, a physician and a technician and not having complementary tests available[1]. Mutual respect, empathy and knowledge is essential to be able to work with quality and efficiency. Furthermore, when patient transfer is performed in a medicalized helicopter, the limited space, deafening noise and vehicle movement can interfere with the patient, material and medical team members themselves. In this context, recording all actions taken, monitoring and care measures, both in situ and during transfer, also adds to the work of nursing staff[2].

The following case, including the transfer of a patient by helicopter, illustrates the complexity of nursing care, which involves teamwork and the need for specific preparation and training in the field of accident and emergency medicine. This report supports the need to create the nursing specialty in accident and emergency medicine to ensure the formal training of professionals and the quality of care[3].

Case report: "Phases of pre-hospital healthcare action"

Alert

Every day, after the change of shift, the emergency coordination center (CCU in Spanish) is informed of who the members of the new team are and that they are now ready to receive the first emergency call. Meanwhile, any missing material is replaced, and the land vehicles and helicopter are checked.

Alarm

11.34 hours. A confusing call is received from the CCU: "Male, 63, unconscious and with pain is being attended by a primary healthcare center team." The pilots, after checking the weather conditions, study the location coordinates reported by the CCU and how to access the health center after landing.

Approach and arrival

11.42 hours. The helicopter takes off in compliance with safety standards and maintains constant communication with the CCU that informs us: "The initial reason for consultation was chest pain; the patient subsequently suffered syncope while being treated." Clearance to land is recei-

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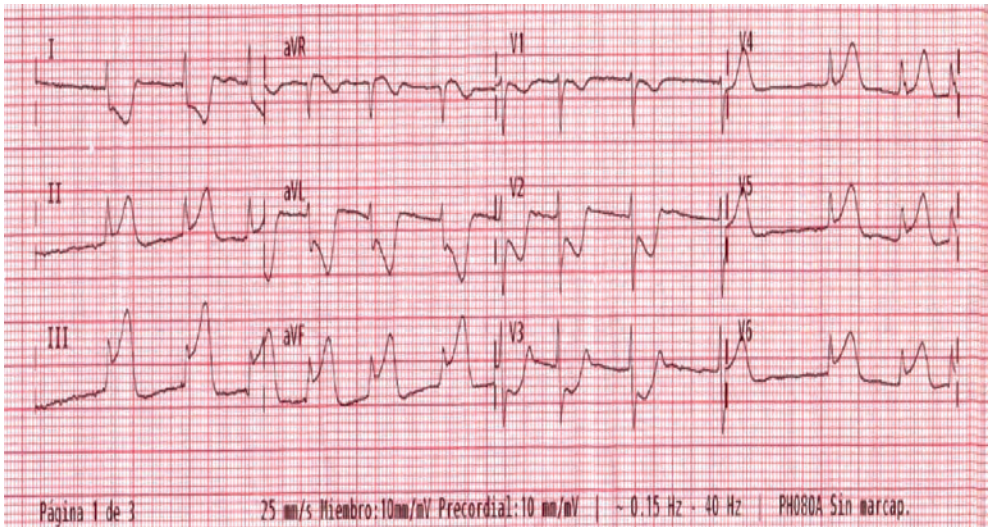

Figure 1. Atrial fibrillation with a ventricular response of 80-90 beats per minute; ST: elevation in lead II, III, aVF, V_5 and V_6 and decrease in I, aVL and V_2-V_3.

ved, and once on the ground, the team is transported to the health center consulting room.

Patient encounter

12.00. We arrive at the center where we find the patient being treated by medical personnel in a small treatment room. The family, very anxious, remains in the waiting room. We begin to assess the patient while listening to the account of the incident according to the primary care team. From the outset, the patient appears to be in serious condition, with decreased level of consciousness. We rapidly perform a primary assessment ("ABC": airway, breathing, circulation) which reveals an open airway and spontaneous breathing but signs of poor peripheral perfusion, pallor, profuse sweating and coldness. No external bleeding is noted. Neurologically ("D") the patient is assigned a Glasgow Coma Scale score of 14 points (eye response: 3; verbal: 5, motor 6)[4,5].

12.05 pm. Vital signs are checked and recorded [blood pressure (BP): 80/-- mmHg, heart rate (HR) 80 beats per minute (bpm), breathing rate (BR) 14 breaths per minute (bpm), oxygen saturation by pulse oximetry ($SatO_2$) 84%; fraction of inspired oxygen (FiO_2) 35%, temperature 35 ºC] and capillary blood glucose: 118 mg/dl. We monitor and perform 12-lead electrocardiography (ECG) (Figure 1). Conclusion: This appears to be a case of acute coronary syndrome (ACS) with ST elevation (STEMI) with possible acute myocardial infarction (AMI) (posterior, lateral or right ventricle-RV-) in a patient with hemodynamic instability. Priorities for stabilization and initial treatment are established. And we prepare for rapid transfer of the patient to the appropriate reference center, in this case one that is capable of performing cardiac catheterization[6].

Secondary assessment

1. The family is informed of the diagnosis and severity. More complete information is requested: the patient, with no known coronary or cardiovascular risk factors, was resting at home when he suffered continuous oppressive chest pain (two hours before our first contact with him), so he visited the health center. There, assessed with suspected ACS, he received 250 mg orally administered aspirin and 0.8 mg sublingual nitroglycerin. A few minutes later he had episodes of unconsciousness with loss of sphincter control and spontaneous recovery. The patient remained hypotensive with low $SatO_2$, so a nº 20 venous access line was established in the right arm and 500 cc saline administered; a Venturi mask with FiO_2 at 35% was placed[6,7]. Given the patient's severe clinical situation, it was decided to notify the CCU.

2. We perform a thorough assessment and start treatment to achieve hemodynamic stability, followed by periodic monitoring of the patient.

The patient remains hemodynamically unstable, with severe chest pain and dyspnea. He presents jugular venous distention, bilateral crackles

to mid lung fields and a third heart sound suggesting severe heart failure ("Killip III-IV") with acute pulmonary edema and cardiogenic pre-shock[8,9].

12.12 hours. BP: 70/-- mmHg, HR: 82 bpm, BR: 14 bpm, $SatO_2$: 82% with O_2 35% Temperature: 35 °C. New ECG unchanged from the previous one (Figure 1).

Given a diagnosis of suspected inferior and lateral AMI with RV involvement and cardiogenic shock, we propose the following measures: increase RV preload with volume input, avoid vasodilators to prevent clinical worsening, decrease RV afterload with positive inotropics (which increase the force of myocardial contraction and decrease cardiac output), provide immediate reperfusion therapy with thrombolysis or primary angioplasty, preserve useful heart rate and atrioventricular synchrony, rule out and treat blockages (pacemaker) and arrhythmias (cardioversion) and other complications[10-12]. Permanent hemodynamic assessment and monitoring of venous access and fixation are always necessary in critical patients before being transported.

12.20 pm: a new peripheral venous access (No. 16) is placed in the left arm. It was decided to switch to mask reservoir bag with 100% FiO_2 and administer the following drugs intravenously: A) meperidine 25 mg (long-acting opioid with analgesic and sedive effect, vagolytic; morphine produces vasodilatation and is vagotonic); B) Dopamine: sympathomimetic (increases HR and BP), infusion of 100 mg in 50 ml of dextrose 5%, started at 5 ml/h and titrated according to response and needs; C) metoclopramide 20 mg after vomiting occurred at 12.25.

12.30. At that time, PA: 70/--mmHg, HR: 84 bpm, BR: 14 bpm, $SatO_2$: 92% FiO_2 of 1. We contact the hospital's cardiac catheterization service, because our patient requires urgent primary angioplasty (reperfusion)[13]. For transfer it is essential to maintain adequate oxygenation and ventilation, and isolation of the airway[12,14]. Intubation (OTI) prepared with: pre-oxygenation with FiO_2 1, 0.5 mg iv atropine (anticholinergic: reduces secretions, prevents vomiting, bradycardia and bronchospasm), midazolam 10 mg iv followed by 5 mg iv at 10 minutes (short-acting benzodiazepine, sedative, hypnotic and anticonvulsive), 100 mg iv succinylcholine (depolarizing muscle relaxant, effective in 30 seconds and lasts for 3-5 minutes). We perform the OTI maneuver with an endotracheal tube (no. 8.5) and the balloon is inflated with 7 cc only - this is a helicopter transfer - and ensure good fixation. The patient is ventilated with self-inflating balloon bag on the way to the helicopter, where mechanical ventilation is started. Vital constants are monitored before the transfer; the family is informed about the seriousness of the situation and the destination of the patient.

12.40. At that time, PA: 75/40mmHg, HR: 86 bpm, BR: 14 bpm, SaO_2: 94% and FiO_2 of 1.

Transport

An ambulance takes us to the helicopter (on the way we increase the dose of dopamine to 12 ml/h). Once inside, the patient is connected to ventilator with capnographic control, placed supine at 30 degrees (semi-Fowler position) and proper suction ensured. During flight, we pay special attention to the visual alarm signs (no sound is audible in flight) without taking our eyes off the patient and monitor at any time[15-17]. The initial ventilator settings are shown in Table 1. The airlift is completed without incident, the patient is stable, with good capnometry and aspiration of secretions, and seried vital signs (Table 2). During the flight he continued to receive intravenous medication: meperidine 25 mg, midazolam 5 mg two boluses with a 20-minute infusion of dopamine at 15 ml/h, 10 mg vecuronium bromide (muscle relaxant with long-acting effect between 25-40 minutes).

13.53 hours. Arrival at the hospital helipad where another ambulance takes us to the receiving hospital. We administer 75 mg iv fentanyl (synthetic opioid used in hemodynamically unstable patients because it is less hypotensive than others). Although our patient (100 kg) could tolerate a greater dose, the previous administration of meperidine calls for caution.

14.05 hours. At that time, BP: 75/40 mmHg, HR: 90 bpm, RR: 12 rpm, $SatO_2$: 91% and FiO_2 1.

Transfer

14.10 hours. The hospital hemodynamic unit responsible for the continuity of care takes charge

Table 1. Ventilator settings

MODO	Vt (ml)	FR (bpm)	FiO_2	I/E	Pmax (con H_2O)	PEEP (con H_2O)
IPPV	5OO	12	100%	1-1.8	40	10

Vt: tidal volume; RF: respiratory frequency, FiO_2: fraction of inspired oxygen, I/E: ratio between inspiration and expiration Pmax: maximum peak pressure, PEEP: positive end expiratory pressure; IPPV: intermittent positive pressure ventilation.

Table 2. Serial control of vital signs and respiratory parameters

Hora	BP (mmHg)	HR (bpm)	RF (bpm)	$SatO_2$ (%)	FiO_2	Capnometry (mmHg)
13:05	90/50	92	12	90	1	33
13:15	100/70	97	12	92	1	35
13:30	80/40	82	12	93	1	33

BP: Blood pressure, HR: heart rate, RF: respiratory frequency.

of the patient, and we provide the receiving team with a verbal and written report. Then we are taken back to the helicopter and returned to our base. We clean and replace the material used and prepare for the next assignment.

The patient underwent percutaneous transluminal coronary angioplasty but died the following day in hospital.

Nursing

The work of nursing work has two aspects: the first is the series of activities resulting from the diagnosis made by the physician (delegated part of medical work). The second is specific to the nurse, not delegated and based on so-called nursing diagnoses[18]. These include real or potential health problems identified by the nurse which determine the actions necessary to resolve, minimize or prevent them. This is what is known as "nursing care plan"; it includes the problems, goals and proposed actions[19-21]. In order to unify the terminology, several classifications of diagnoses, outcome criteria (objectives) and nursing interventions have been integrated and today we use the internationally accepted classification: NANDA-NOC-NIC[22,23].

Thus arose the classification of NANDA (North American Nursing Diagnosis Association); after several revisions, the NANDA II classification came into use in 2007[22]. Each diagnosis is made up of a label (title of diagnosis), the definition, defining characteristics (signs and symptoms) and some related factors. Potential diagnoses are made by the label, definition and associated risk factors.

In 1991 a research team at the University of Iowa (USA) developed an international classification of results, first published in 1997. This created the NOC (Nursing Outcomes Classification), representing a standardized classification of the results to be achieved in order to evaluate nursing interventions[23]. Each NOC has a label, definition, list of indicators and a five-point scale to measure patient status (in this article we have relied on the third edition published in 2004).

Nursing interventions to achieve the objectives that arise in each patient are well established internationally, and easily evaluable. These are covered by the so-called NIC (Nursing Interventions Classification). Each NIC has a label, a definition and a set of activities. The latest edition was published in 2004[23].

In this case report, after assessing the patient's situation, we established the diagnosis, and proposed the goals and nursing interventions to be carried out (Tables 3 and 4).

Discussion

Inferior AMI with RV involvement is associated with a mortality rate of 25-30%[24]. Pre-hospital care professionals must work together to reduce this percentage, which, in addition to dedication, needs specific training to be able to perform a series of technically complicated procedures. For example, our case involved the care of a patient with ACS and hemodynamic instability, needing OTI and mechanical ventilation, as well as safe helicopter transfer. At present the work of accident and emergency nursing has a large vocational component, but also a body of doctrine subject to ongoing assessment, and this requires the establishment of its own nursing specialty. Specialization is necessary to achieve better quality of care and the power to create this lies with the Ministry of Education and Science. Royal Decree 450/2005 of April 22 (BOE 05/06/2005) only recognizes the following nursing specialties: gynecology-obstetrics (matron), mental health, geriatrics, work, medical and surgical care, family and community medicine and pediatric nursing[25].

The need for nursing specialization in accident and emergency medicine should be beyond dispute. We have seen here how nurses must possess the knowledge and skills to perform complex tasks such as: ECG monitoring, airway management, mechanical ventilation, pharmacology, clinical symptoms of ACS and demanding therapeutic maneuvers.

We hope that with such examples, nursing specialization in the field of accident and emergency medicine will soon become a reality, contributing to form a truly professional team to act

Table 3. Nursing diagnoses and corresponding NOC-NIC

Nursing diagnoses	NOC	NIC				
00024.	0400. Effectiveness of the pump	1400	2380	4062	4140	4254
Ineffective CP	0401. Circulatory status	1910	3300	4066	4150	6140
tissue perfusion	0402. Respiratory state: gas exchange	2000	3320	4070	4180	6200
due to sudden extreme	0405. Tissue Perfusion: Cardiac	2080	3350	4090	4190	6320
decrease of	0408. Tissue perfusion: pulmonary	2260	3900	4106	4200	6650
coronary circulation	0802. Vital Signs	2300	4044	4110	4235	6680
		2314	4050	4120	4238	7880
00029.	0400. Effectiveness of the pump	0180	3140	4090	4200	6320
Decreased cardiac output	0401. Circulatory status	1400	3320	4106	4235	6650
in relation to	0405. Tissue Perfusion: Cardiac	1910	3350	4120	4238	6680
electrical and mechanical	0406. Tissue perfusion: cerebral	2000	4044	4130	4254	7820
factors of the heart	0404. Tissue perfusion: abdominal organs	2080	4050	4140	4256	
	0407. Tissue perfusion: peripheral	2300	4062	4150	5820	
	0408. Tissue perfusion: pulmonary	2380	4066	4180	6140	
	0802. Vital Signs	2550	4070	4190	6200	
00030.	0600. Electrolyte and acid-base balance	0180	2380	3300	4130	6320
Impaired gas exchange	0402. Respiratory state gas exchange	1400	3120	3320	4150	6650
related to pulmonary	0403. Respiratory state ventilation	1910	3140	3350	4190	6680
congestion secondary	0408. Tissue perfusion: pulmonary	2000	3160	3390	4200	7820
to right ventricular	0411. Response to mechanical ventilation: adult	2080	3180	4106	5820	
dysfunction	0802. Vital Signs	2300	3200	4120	6200	
0132.	1605. Pain Management	1400	2300	3320	4235	5820
Acute pain related	2100. Comfort Level	2210	2314	4190	5270	6650
to disproportionate	2102. Level of pain	2260	2380	4200	5460	6680
decrease or abrupt						
discontinuation of oxygen						
supply to myocardial cells						
00134.	1618. Control of nausea and vomiting	1450	2080	3900	4130	5880
Nausea related to	0602. Hydration	1570	2380	4120	4190	
hemodynamic instability	2100. Comfort Level					
caused by deterioration	2107. Severity of nausea and vomiting					
of heart function						
00146.	1302. Problems coping	2300	5270	5820		
Anxiety related to deterioration	1211. Anxiety level	4920	5350	5880		
of cardiac activity, real or	2100. Comfort Level					
perceived threat to biological						
integrity						

CP: cardiopulmonary; RV: right ventricle.

with speed, efficiency and quality despite the complexity of situations that may arise in everyday practice.

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Table 4. Nursing interventions performed in this case report

1400	Management of Pain	4070	Circulatory precautions
1450	Management of nausea	4090	Arhythmia management
1570	Management of Vomiting	4106	Care of pulmonary embolism
1910	Acid-base management	4110	Precautions embolism
2000	Electrolyte management	4120	Management of liquids
2080	Liquid/electrolytes	4140	Fluid replacement
2210	Administration of analgesics	4150	Hemodynamic regulation
2260	Management of sedation	4180	Management of hypovolemia
2300	Administration of medication	4190	Intravenous puncture
2314	Medication Administration: Intravenous (IV)	4200	Intravenous therapy
2380	Medication Management	4235	Phlebotomy: venous access line
2550	Improvement of cerebral perfusion	4238	Phlebotomy: venous blood sample
3120	Intubation and stabilization of airway	4254	Management of cardiac shock
3140	Airway Management	4920	Active listening
3160	Airway Aspiration	5270	Emotional support
3180	Management of artificial airways	5350	Transfer stress support
3200	Precautions to prevent aspiration	5460	Contact
3300	Mechanical Ventilation	5820	Decrease anxiety
3320	Oxygen therapy	5880	Relaxation technique
3350	Respiratory Monitoring	6140	Emergency Code Management
3390	Assisted ventilation	6200	Emergency care
3900	Temperature regulation	6320	Resuscitation
4044	Cardiac care: acute	6650	Surveillance
4050	Cardiac precautions	6680	Monitoring vital signs
4062	Circulatory care: arterial failure	7820	Taking blood samples
		7880	Technological device management

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