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Managing the severely injured patient

BEST Foundation: Better & Systematic Team Training
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Outline of the day

Introduction to team training

- Trauma team training

Contents

- ABCDE examination
- Leadership
- Cooperation
- Communication
- Simulation 1 with debriefing
- Simulation 2 with debriefing



Outline of the day

- 08:30 – 12:00: Lectures & discussions
- 12:00 – 13:00: Lunch
- 13:00 – 15:00 Simulation 1 and 2
- 15:30 – 16:00 Wrap-up



Outline of simulations

- Team 1 & 2
 - 13:00 - 13:20 Simulation 1
 - 13:20 - 14:00 Discussion 1
 - 14:00 - 14:20 Simulation 2
 - 14:20 - 15:00 Discussion 2 & summary

Goals for today

- No advanced surgical or anaesthetic procedures
- Discussion about improvement of trauma systems
- Basic education of all personnel groups
- Practical training of team work

Common starting point

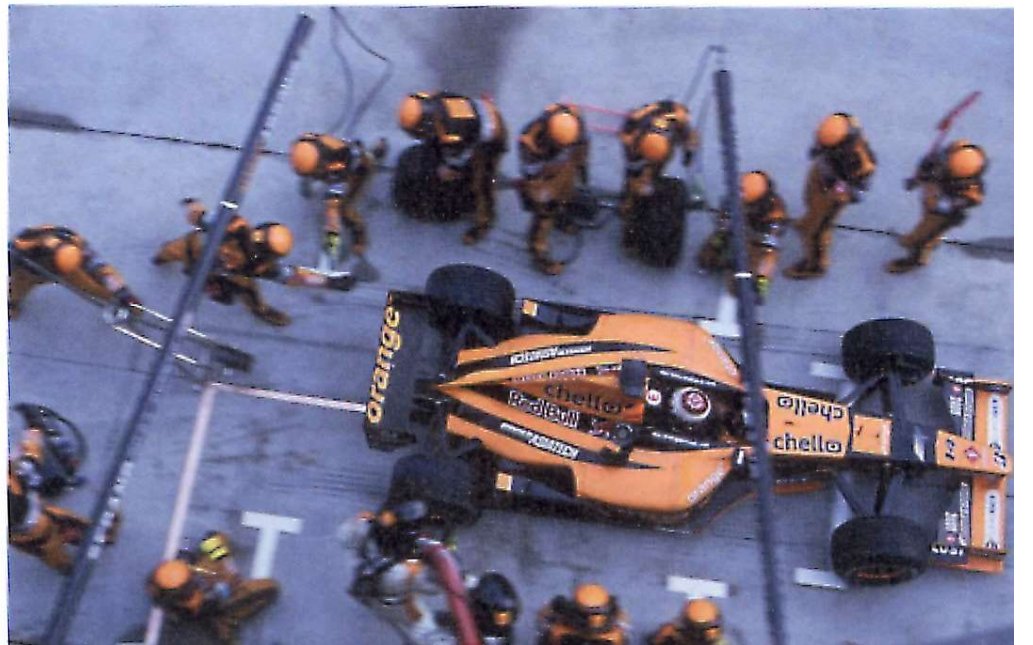
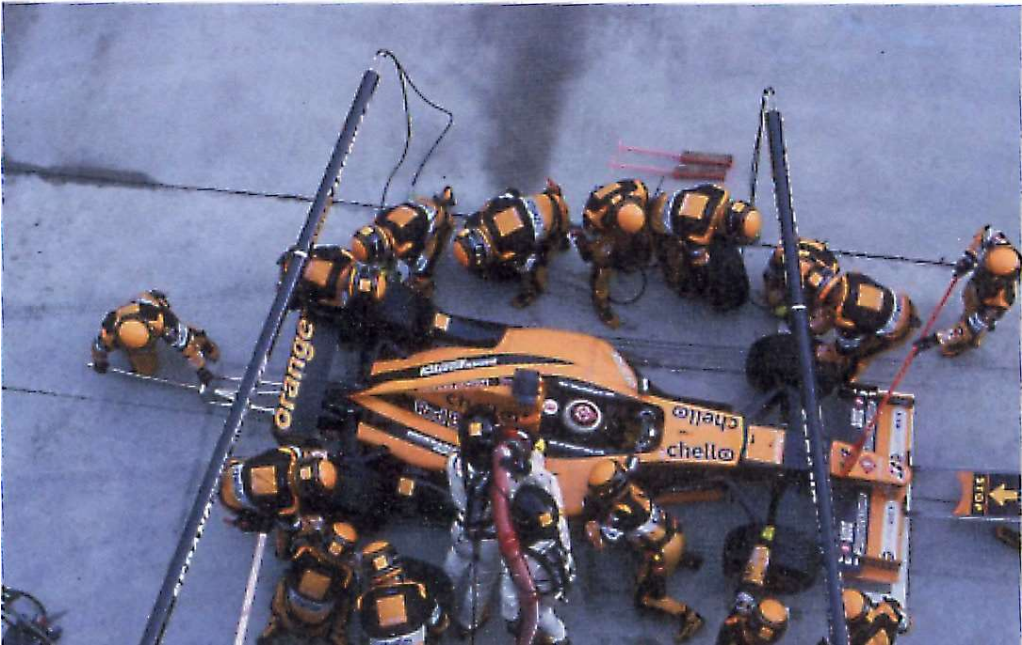


Use own equipment



Train leadership, communication and co-operation

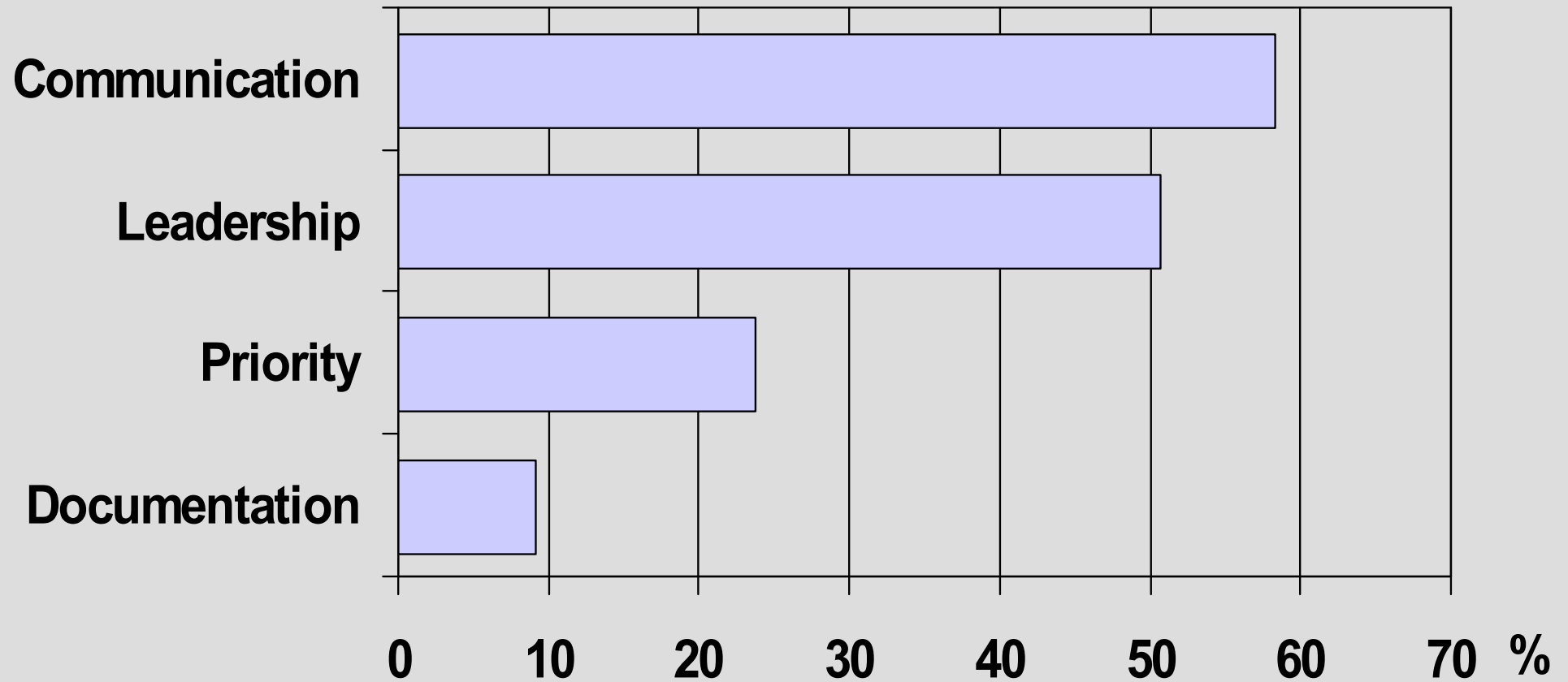




What are the challenges?

- In your department?

Problems during initial assessment



(n = 3000)

Goals for effective trauma care

- Resuscitate and stabilise vital functions
 - Identify and treat life-threatening injuries
 - Identify other injuries
 - Prioritise management of the injuries
-
- Determine the need for transfer to a trauma centre for definitive care, and if so prepare for transfer

Primary survey

- A Airway with cervical spine protection
 - B Breathing & ventilation (w/ 100% O₂)?
 - C Circulation with haemorrhage control
 - D Disability: Neurological status
 - E Exposure /environmental control
Undress the patient, but prevent hypothermia
-
- Resuscitation during primary survey**

Secondary survey

- ABCDE is completed!
- If the patient deteriorates – Start again with ABCDE
- Systematic and detailed examination of the entire patient

Systematic trauma care

- ❑ High quality trauma care is identical all over the world
- ❑ What matters to the patients is the combined actions, not individual “star players”





Airway and Ventilation

Airway assessment

Look

Feel

Listen (remember both sides of the chest)

Airway management

- Chin lift / jaw thrust
- Oropharyngeal / Guedel airway
- Suction
- Airway may need protection against aspiration if reduced level of consciousness
 - Position (lateral recovery position)
 - "Definitive" airway: Tracheal intubation

Jaw thrust



Oxygen

- Supplementary oxygen if SpO₂ less than 94 %
- Technique:
 - In spontaneous ventilation: Face mask with reservoir, 5 litres O₂ / min
 - Mask & bag-assisted ventilation
 - Endotracheal intubation and positive pressure ventilation

Max flow (4-5 litres/min)

Oxygen mask with reservoir



Breath sounds - none or abnormal

Bilateral:

- Obstructed airway (tongue, oesophageal ET-tube?)
- Major chest injuries

Unilateral:

- Pneumothorax / haemothorax
- Lung contusion, «Flail Chest»
- Obstruction (aspiration, foreign body etc.)
- Diaphragmatic rupture
- Ruptured bronchus
- If an ET tube is placed: Endobronchial intubation

Neck injury?

Suspected if:

- Fall, deceleration, injuries to head or upper chest
- Patients who are unconscious

Management:

- Avoid flexion and extension of the neck
- Stabilise in a neutral position, supine or supine lateral
- “Log-Rolling” and in-line stabilisation
- One person assigned to do in-line stabilisation during intubation

- CT of neck to rule out injury



A&B

**Assisted ventilation
Bag/valve/mask (BVM)**



Endotracheal intubation

□ Indications

- Protection of airway
- Need for controlled breathing
 - Apnea
 - Respiratory failure
 - Severe head injury
- Will influence circulation



Airway management

Every A&ED should have equipment, policy and training in airway management

And of the unexpected difficult airway



Chest x-ray

- ❑ Chest and pelvic XR of all patients during primary survey, preferably in the emergency department

- ❑ Possible information:
 - haemo- / pneumothorax & tube position
 - diaphragmatic rupture, aortic-, tracheal- or bronchial injuries

- ❑ Remember:
 - Always consider new XR after intubation or chest tube
 - Reassess as necessary

Case for discussion

- What would you do if you were admitting this patient?
- Discuss with your colleague

Airway anatomy

A&B



Life-threatening A & B injuries

- Airway obstruction
- Tension pneumothorax
- Massive haemo- / pneumothorax
- Open injuries to the airway or chest

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Circulation and Haemorrhage Control

Circulatory Shock: Hypoperfusion

- Life threatening!
- The diagnosis is based on clinical findings
- Recognize the condition early and identify the source of bleeding

Goal:

- Re-establish organ perfusion with oxygenated blood

Clinical signs of shock

- Increased respiratory rate
- Increased heart rate
- Cold and clammy skin
- Prolonged capillary filling
- Weak peripheral pulse, reduced pulse pressure, reduced blood pressure
- Reduced level of consciousness, anxious or combative patient
- (Reduced urinary output)

Causes of circulatory shock

- Volume loss
- Tension pneumothorax
- Cardiac tamponade

When signs of circulatory shock are present, the cause is haemorrhage until proven otherwise!

Where does it bleed?

- Abdomen
- Thorax
- Pelvis
- Fractures of the femur or humerus

It is the total amount of blood loss that is important!

Diagnostic tools:

- Chest & pelvic XR
- Ultrasound-FAST
- (Diagnostic Peritoneal Lavage)

Resuscitation of patients in shock

1. Patent airway and adequate ventilation

2. Stop the bleeding

Direct pressure to external wounds (incl packing)

Temporary external fixation of pelvic fractures (pelvic sling)

Chest tube?

Iv TXA

Damage Control Surgery

3. Fluid therapy (pre-warmed fluids if available):

Crystalloids with boluses of 250 ml

O Rh-neg. blood or cross matched blood

Whole-blood?

Resuscitation cont.

4. Pain control

Ketamine i.v. or Morphine/Pethidine i.v.

5. Avoid hypothermia

Remove wet cloths and cover the patient

Pre-warmed i.v. fluids

(External heating if ambient $T_p < 28\text{ C}$)

Pelvic fractures

□ Assessment

- Mechanical instability: Manual manipulation unreliable!
- Progressive scrotal / perineal swelling
- External rotation of lower extremities
- Pelvic XR
- Blood at the urethral meatus / high-riding prostate

□ Mechanical instability in the haemodynamically unstable patient:

- **Mechanical stabilization of the pelvic ring:**
 - Improvised sling, SAM-Sling, T-POD



C

Simpson T, Krieg JC, Heuer F, Bottlang M. Stabilization of pelvic ring disruption with a circumferential sheet.

J Trauma 2002; 52: 158-61.

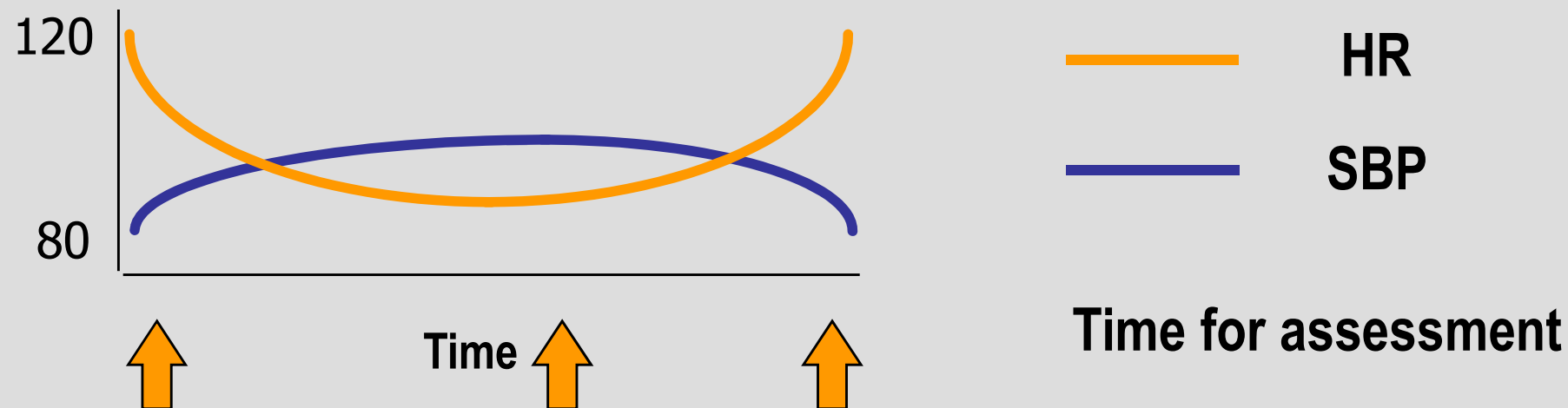
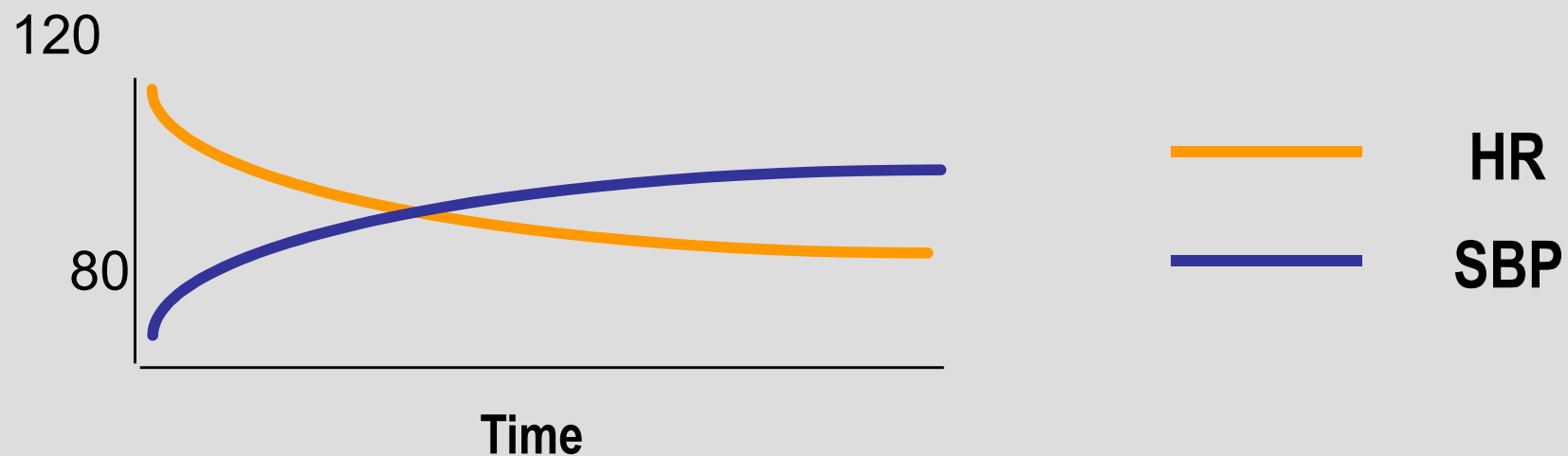
After A, B & C is completed

- Time for summing up!
 - “The whole picture”
 - Update the team
 - Identify omissions

Damage Control Surgery

Surgical management of the unstable hypovolaemic patient

Hypovolaemia – Reassessment



“The lethal triad”

- Hypothermia
 - temperature < 35,4°C
- Acidosis
 - pH < 7.20
- Coagulopathy



Disability
"Head Injuries"

Head Injuries

- “Patients who talk and die”
 - Some patients who die from head injuries, have been able to give an adequate verbal response after the accident
 - These patients die due to the secondary injuries: Bleeding and increased intracranial pressure

- Reduced consciousness \Rightarrow obstructed airway
 - Hypoxia, hypercapnia and acidosis

Mortality after head injuries

Secondary insult	mortality (%)
Hypoxia	33
Hypotension	60
Both above	75 !
None of the above	27

Glasgow Coma Scale (GCS)

- **Eye Opening (E)**

- Spontaneous 4
- To voice 3
- To pain 2
- None 1

- **Verbal Response (V)**

- Oriented 5
- Confused 4
- Inappropriate words 3
- Incomprehensible words 2
- None 1

- **Best Motor Response (M)**

- Obeys commands 6
- Localize pain 5
- Withdraws pain 4
- Flexion pain 3
- Extension pain 2
- None 1

SUM GCS

3-15

Head injuries

- Repeated examinations
- Mini-neurological assessment
 - Consciousness - GCS
 - Pupillary light response
 - Normal symmetrical muscle strength and sensation
- NEVER ascribe symptoms to excessive alcohol
- Blood glucose



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E

Environment

“Exposure & environment”

- Remove clothes
- Avoid hypothermia (Temperature)
 - No air-condition (except for warming)
 - Warm environment (room temperature)

Equipment

- Make a system
 - Equipment cabinet, boxes or trays
 - Seal and sign
 - Check regularly (every day?)
 - One nurse responsible every day
-
- Wall posters (GCS)



Equipment



Examinations during primary survey

Chest XR

Pelvic XR

FAST - US

Other early adjuncts:

– Cervical spine XR

– Protect neck

Blood samples

- Blood samples:
 - Arterial blood gas (ABG)
 - Type & cross match
 - Haemoglobin
 - (Blood glucose)

What to monitor

- Respiration
- Heart rate (and pulse volume)
- Blood pressure
- Temperature
- Urinary output
- Level of consciousness (GCS)
- Skin (dry or moist and cold)

Observations must be documented with time!



Goals for resuscitation

- Open airway and adequate ventilation, with cervical spine control
- Systolic BP > 90 mm Hg
- Stable circulation and haemorrhage control
- Temperature > 36°C



Secondary survey

- ABCDE is completed

- Detailed head-to-toe examination
 - Attempt to identify all injuries
 - Determine the mechanism of injury

- If the patient deteriorates: Reassess ABCDE !

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**Communication, cooperation
and leadership**

For discussion

- ❑ How should your team members communicate to you?



Aspects of medical team work (“CRM”)

- Quality of collaboration
 - Shared mental models
 - Situational awareness
 - Co-ordination
 - Communication
 - Leadership
 - Decision making
-
- = “Non-technical skills”



Are there «A big 5» in teamwork?

3 fundamental principles:

Shared mental models

Closed loop communication

Mutual trust



Leadership and decision making

- Keep overview
- Distribution of tasks (correct order)
- Creation of shared mental models & mutual understanding
- Prioritizing
- Cross-checking information



Psychological Safety...

Level the playing field

- Do you know all the names of the personnel you work with? “Hi, I’m _____. I’m sorry I missed your name.”
- “I don’t have any pride invested here. I just want to get it right, so if you think I am doing anything wrong, please let me know.”

Environment of Respect

- “A fundamental, non-negotiable respect for every employee, everyday, by everyone”
- The work is recognized and acknowledged



Different Communication Styles

- National culture
- Gender
- Roles (Physician, Nurse, Manager)
 - Nurses: narrative & descriptive
 - Physicians: problem solvers “just give me the facts”



Structured Communication: ISBAR

If the phone goes dead in 10 seconds -

Will the person on the other end know what is needed?

Identification - Present yourself

Situation - State the actual situation you are in (5-10 seconds punch line)

Background - State what you are calling about (including objective data i.e. vital signs, labs)

Assessment - State what you think the problem is (diagnosis not necessary - include severity)

Recommendation - State what you think needs to be done for the patient (get a time frame)



“Resource Management”

- Situational awareness (What is going on?)
- Prioritise the tasks in correct sequence
- Delegate relevant tasks
- Leadership and team-coordination
- Clear and confident communication
- Mobilising the available resources
- Monitoring and comparing available clinical data
- “Thinking aloud” – shared mental model

Team leader

- Who is the trauma team leader? Doctor?
- Which tasks do the team members carry out and when? (plan)
- Ensures that tasks are carried out in the correct order
- Other resources (anaesthesia, others?)
- Summarises regularly patient status (ABCDE) to the team
- Responsible for the patient until assessed, stabilised and can leave Casualty with a plan for further management
- Inspires the respect of the trauma team



Effective communication

- ❑ Time outs & frequently summing up will enhance shared mental models. Use names or functions
- ❑ Being direct & polite is contagious!
- ❑ Speak loudly and clearly, don't shout
- ❑ Avoid arguing
- ❑ "Closed Loop" – acknowledge messages
 - *"Can you please get an oxygen cylinder?»*
 - *"I will find an oxygen cylinder!»*
- ❑ You can practice this at home....!



Barriers to communication

- Uncertainty, trainees
- Anger, frustration and emotional reactions
 - Children, victims of violence, pregnant women, colleagues, strong smells & external haemorrhage
- Focus on procedures & tunnel-vision
- Noise & interruptions
- Wrong priorities & certainness / over-confidence
- Unfamiliar environment
- Leadership not clearly stated
- Language barriers



Communication

”I am concerned that the patients’ BP has not improved despite 4 litres **infusion**, and there is no blood coming on the chest drains.

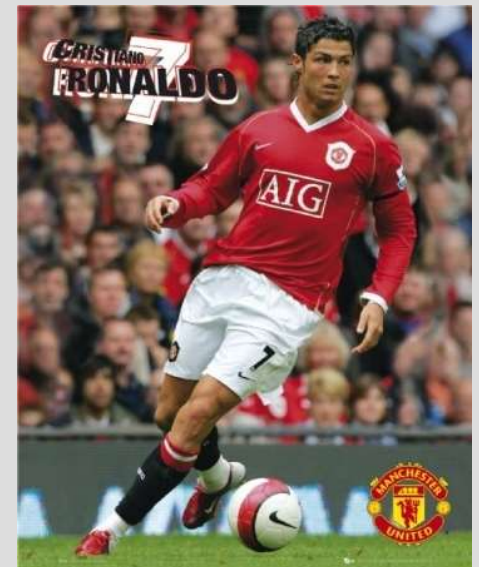
I think the patient may have an abdominal haemorrhage although the initial US scan only showed minimal intra-abdominal fluid levels.

Don’t you agree (surgeon) that the patient may need damage control surgery?”



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How to become trauma champions ?



Success factors

- Trauma committee

 - Create a trauma team

 - Make local guidelines

 - Organize room and equipment

- Defined procedures

- Regular training of all trauma team members together



Guidelines



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Case discussion

- What do nurses think is the most important doctors could improve?
- What do doctors think is the most important nurses could improve?



How can we improve?

- Establish routines, one by one
- Continually review areas and routines which can be improved
- Discuss real cases and experiences, M&M-meetings?
- Listen to new colleagues
- Regular multidisciplinary trauma meetings where problems can be discussed, morbidity and mortality meetings, BEST- network
- Trauma registries for quality control



Simulation training



Network meetings



Checklist & patient observation form

 Age: _____ Name: _____ Date Of Birth: _____ Sex: <input type="checkbox"/> Female <input type="checkbox"/> Male	Pre arrival check list <input type="checkbox"/> Team complete <input type="checkbox"/> Equipment checked <input type="checkbox"/> X-ray protection <input type="checkbox"/> Team informed	Prehospital vital signs BP: _____ / V: _____ SpO ₂ : _____ Resp rate: _____ Pulse rate: _____ Temp: _____ Medications: _____ GCS: _____ Intubated <input type="checkbox"/> Neck stabilized <input type="checkbox"/> ASA: <input type="checkbox"/>	Hospital: _____ Arrival: (mm/hh) _____ / -20 Relatives: _____ Informed: Y <input type="checkbox"/> N <input type="checkbox"/> Phone: _____ By whom: _____ When: _____	Data about the injury Time of injury: _____ / _____ / _____ Site of the accident: _____ Mechanism of injury/type: _____ Penetrating Y <input type="checkbox"/> N <input type="checkbox"/> Physician attend: _____	<input type="checkbox"/> RTA _____ Seat belt used Y <input type="checkbox"/> N <input type="checkbox"/> <input type="checkbox"/> Fall _____ m <input type="checkbox"/> Assault - partner <input type="checkbox"/> Assault - non-partner <input type="checkbox"/> Self inflicted <input type="checkbox"/> Occupational <input type="checkbox"/> Stab wound <input type="checkbox"/> Gun shot wound	Personnel: Team leader: _____ Surgeon: _____ Orthopedist: _____ Anesthetist: _____
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Check list:

- Oxygen 15 l/min
- Open airways/intubation, time: _____
- Neck stabilized
- Respiratory rate
- Chest examined
- Chest x-ray, time: _____
- 2 l.v. lines
- Urinary catheter Size: _____ Time: _____
- Pelvis examined
- Pelvic x-ray, time: _____
- Abdominal US/peritoneal lavage, time: _____
- Blood samples/Arterial Blood Gases
- Monitoring
- Evaluation of consciousness


Glasgow Coma Scale

Eye opening	Verbal response	Best motor response
Spontaneous 4	Orientated 5	Obeys commands 6
To voice 3	Disorientated 4	Localises pain 5
To pain 2	Inappropriate words 3	Withdraws from pain 4
None 1	Incomprehensible sounds 2	Flexion to pain 3
	No verbal response 1	Extension to pain 2
		No motor response 1

Sensibility/motor response
 Pupillary response

Temperature
 Hypothermia prevention
 Gastric tube
 Tetanus Antibiotics
 Urine stix/Pregnancy test
 The back examined
 Pain relief
 Pain score (Visual analogue score (VAS))

Time:	10	20	30	40	50	0	10	20	30	40	50	0	10	20	30	Notion
SpO ₂																
Respiratory rate																
Urinary output																
RingenNaCl																
Eye opening																
Verbal response																
Best motor response																
GCS total																
Pupillary size																
Pupillary reaction RL																

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NOTE

- Make sure you know the trauma room and the equipment
- Plan together for forthcoming actions
- Ask for help in time
- Be responsible and follow the team leader
- Distribute work tasks and use available resources
- Communicate clearly and use all available information
- Avoid unnecessary focus – keep an overview
- Double check drug doses, tube connections etc.
- Use check lists and procedures
- Summarize often and document your findings
- Be prepared in case the patient deteriorates
- Remember; lack of control of airways, ventilation and bleeding can kill instantly

Eye opening

4 Spontaneous
3 To voice
2 To pain
1 None

Verbal response (Adult)

5 Orientated
4 Disorientated
3 Inappropriate words
2 Incomprehensible sounds
1 No verbal response

(Children)


5 Smile/babbles
4 Irritable cry
3 Cries to pain
2 Moans to pain
1 No verbal resp


Best motor response

6 Obeys commands
5 Localises pain
4 Withdraws from pain
3 Flexion to pain
2 Extension to pain
1 No motor response

pain stimuli

GLASGOW COMA SCALE

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A

- Oxygen 15l/min
- Open airways/intubation
- Stabilise neck (collar/pads)

B

- Respiratory rate
- Thorax stable/chest tube
- Chest x-ray, time: _____

C


- 2 large bore l.v. lines
- Pelvic x-ray, time: _____
- US abd/peritoneal lavage
- Blood samples

D

- Glasgow Coma Score
- Sensibility/motor response
- Pupillary response

E

- Temperature
- Examine the patients back
- Urinary catheter
- Nasogastric tube
- Tetanus
- Antibiotics
- Arrival status registered

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Simulation “rules”

- Employ the usual trauma rooms, personnel and equipment
- Engage yourselves in the simulation
- Make the simulation as realistic as possible
- Facilitator provides data when the examination is complete, but is otherwise passive
- Loyal to the training process
- Focus on communication, cooperation and leadership



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Good luck!