

Electrisation



François Javardin

Définition



Électrisation : ensemble des manifestations physiopathologiques liées à l'action du courant électrique sur l'organisme

Électrocution : décès dû au courant électrique

Fulguration : action de la foudre sur le corps



Blessures ou brûlures mineures

Atteintes cardiaques, respiratoires, neurologiques, cutanées, rénales et musculo-squelettiques



Lésions potentiellement mortelles avec morbidité importante sur le long terme

Potential injuries



Cardiovascular

- Arrhythmias (most common)
- Heart muscle injury
- Bradycardia
- Clotting in blood vessels



Respiratory arrest

- Diaphragm paralysis
- Tetanic contraction
- Inhibition of control in brain



Skin burns

- Infection
- Dehydration



Neurological

- Loss of consciousness
- Impaired recall
- Spinal cord injury
- Paralysis
- Loss of sensations in limbs



Kidney failure

- Myoglobin tubular precipitation
- Generalized hypotension



Musculoskeletal

- Fractures/luxations
- Muscle damage
- Rhabdomyolysis
- Compartment syndrome



Blessures ou brûlures mineures

Atteintes cardiaques, respiratoires, neurologiques,
cutanées, rénales et musculo-squelettiques



Lésions potentiellement mortelles avec
morbidité importante sur le long terme

- Troubles rythmiques
- Lésions du tissu myocardique

Potential injuries



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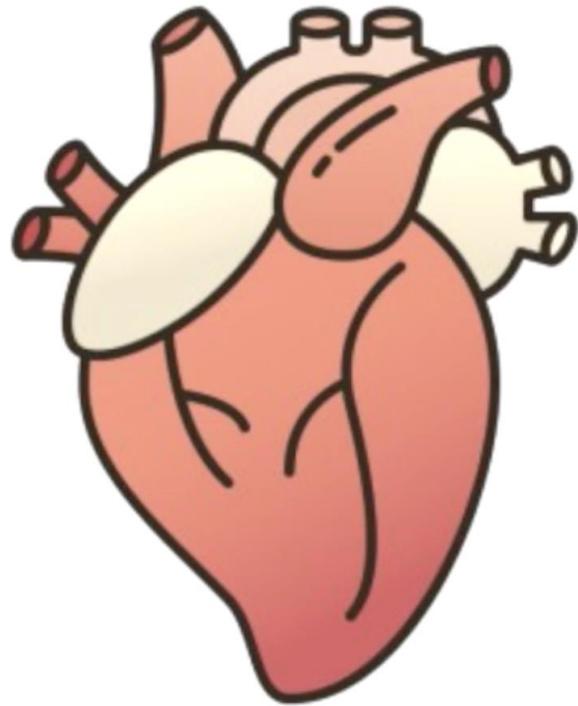
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Atteintes supra-ventriculaires:

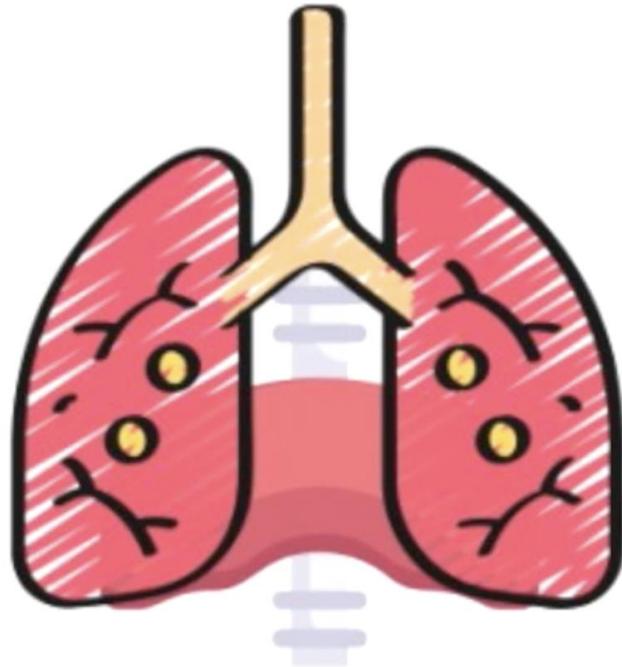
- Tachycardie sinusale
- Extrasystoles atriales
- Fibrillation atriale

Arythmies ventriculaires:

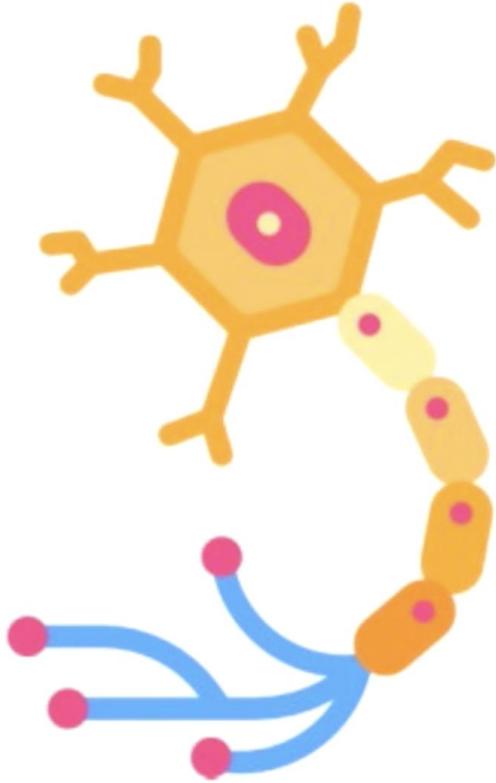
- Extrasystoles
- Tachycardie ... voir fibrillation!

****Rarement: bradycardie ou occlusion coronaire**

- Paralysation des muscles respiratoires (ex. Diaphragme)
- Contractions anarchiques avec hauts voltages (+ que 1000 volts)
- Phénomène rare d'inhibition central de la respiration



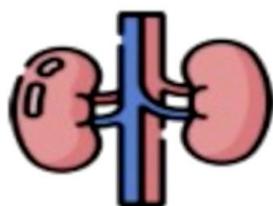
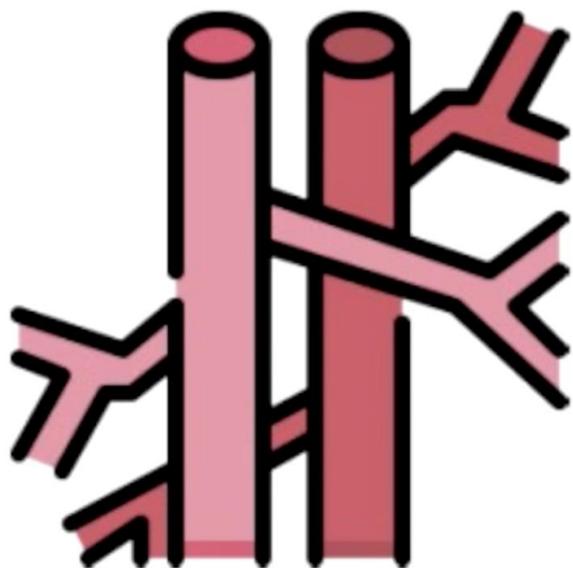
Possibilité d'atteintes neurologiques centrales



- Perte de connaissance initiale
- Paralysie transitoire

Atteintes vasculaires:

- Thrombose
- Précipitation de myoglobine dans les tubes rénaux
- Lésions traumatiques périphériques



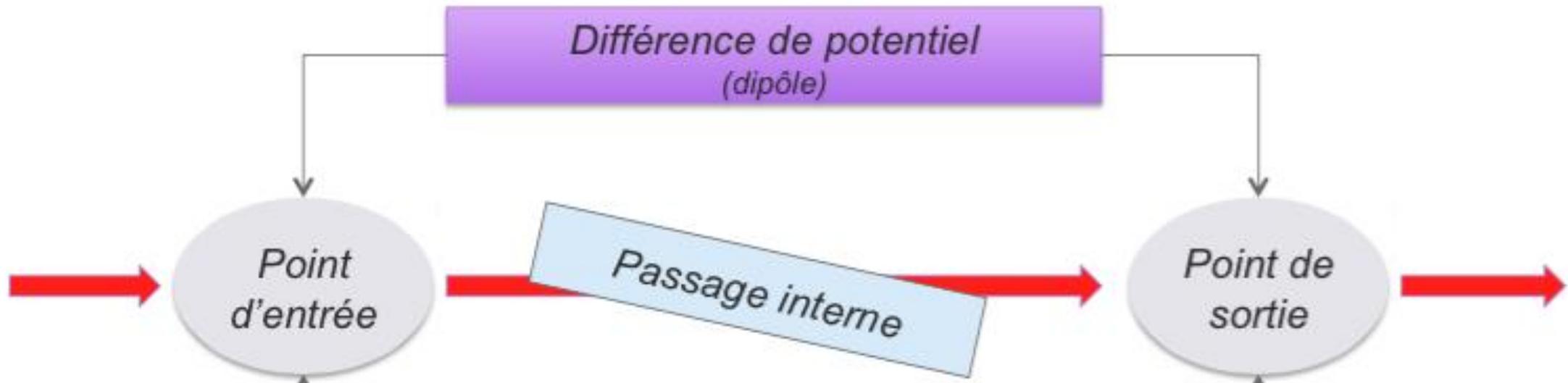




Brûlure de la commissure labiale

- . enfant ++
- . risque esthétique et fonctionnel
- . avis chirurgical systématique
- . risque hémorragique entre j5 et j15 sur chute d'escarre





Marques de Jellinek



Marques de Jellinek



Femmes enceintes



- Risque de mort fœtale même si électrisation bénigne (liquide amniotique très bon conducteur)
- RCIU
- Oligohydramnios
- Décollement placentaire





CLINICAL UPDATES

Electrical injury

Victor Waldmann research fellow in cardiology^{1 2 3}, Kumar Narayanan consultant cardiologist, senior research associate^{3 4}, Nicolas Combes consultant cardiologist⁵, Eloi Marijon cardiologist, associate professor of medicine^{1 2 3}

¹Cardiology Department, European Georges Pompidou Hospital, 20-40 rue Leblanc, 75908 Paris Cedex 15, France; ²Paris Descartes University, Paris, France; ³Paris Cardiovascular Research Center, Paris, France; ⁴Cardiology Department, Maxcure Hospitals, Hyderabad, India; ⁵Cardiology Department, Clinique Pasteur, Toulouse, France

Cardiologist

Cardiologist

Cardiologist

Cardiologist



Electrical injuries caused by the action of an electric current on the human body can range from benign small skin burns to life-threatening internal organ damage. Most injuries are sustained through contact with low voltage domestic circuits, and will not need extensive treatment. However, cardiac monitoring is important in selected patients due to risk of cardiac arrhythmias.

Intravenous hydration
May be needed to prevent renal failure

Resuscitation
A prolonged resuscitation attempt is warranted

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A shock to the system

Assessing people with electrical injuries



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1 Early management

Turn off electrical source (if safe to do so)

Perform basic life support if needed

Immobilise head and neck (in severe injury)

Admit to burns unit

Specialised surgical care, such as skin grafts

2 Clinical assessment

Check clinical signs to assess effects of the electrical current on the patient's body

Extensive burns

Pregnant women

Loss of consciousness

Admit to obstetrics

Fetal cardiac monitoring

Determine path of current through body

Electricity usually flows from an electrical source, through the body to the ground. Locating entry and exit points can help to determine which organs could be damaged

Admit to hospital

Patients with initial loss of consciousness, cardiac anomalies, or high-voltage injury require continuous ECG monitoring

Manage organ failure

Echocardiography

With or without:

Cardiac MRI

Coronary angiography

Depending on clinical findings



Monitor ECG for at least 24 hours

Explain to patient the occasional risk of delayed cardiac arrhythmias (which can very rarely lead to sudden death)

Determine voltage of accident

Low voltage

Mines

⚡ 960 V

Subway rails

⚡ 750 V

Workshops

⚡ 380 V

Domestic

⚡ 110 V (US)
220 V (EU)

High voltage

High voltage line

⚡ 45 000–400 000 V

Rail network

⚡ 25 000 V

Overhead line

⚡ 1 500 V

ECG and blood tests

ECG anomaly

Arrhythmias

Troponin rise

3 Discharge

If there is no cause for concern, consider prompt discharge



Arrhythmia-free for at least 24 hours

thebmj

Read the full article online

<http://bmj.co/elec>

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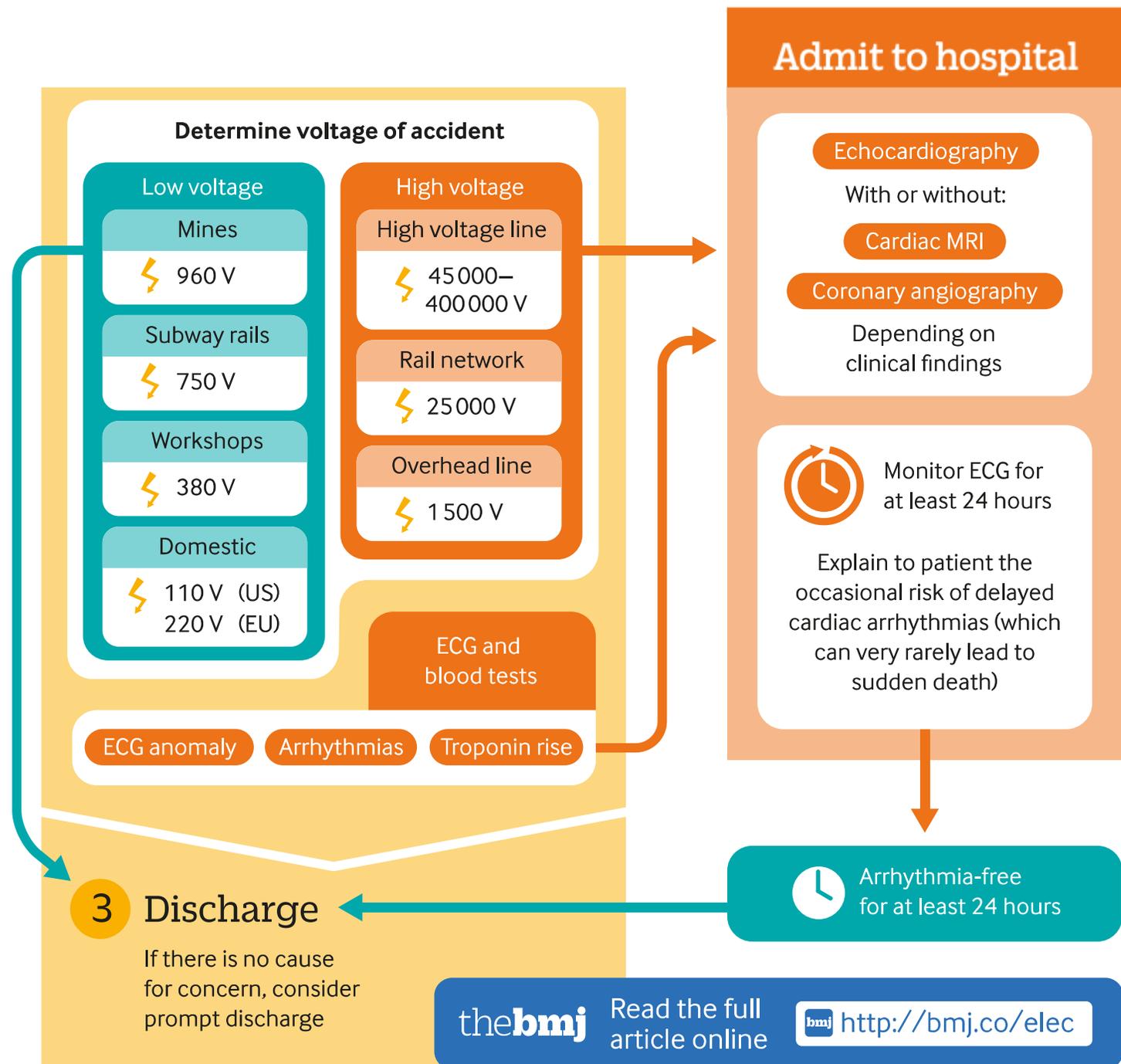
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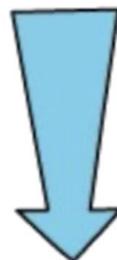


Arrhythmia-free
for at least 24 hours



Bilan initial comprenant:

- Dosage des CPK et des troponines
- Perte de connaissance initiale
- Électrisation à haut voltage (+ de 1000 volts)
- ECG initial anormal
- Augmentation de la troponine sur 2 dosages successifs



Soins intensifs

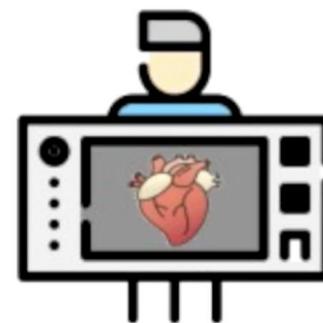
24H



+



+/-





Mettre un urgentiste dans les auteurs qui voit une majorité des électrisations



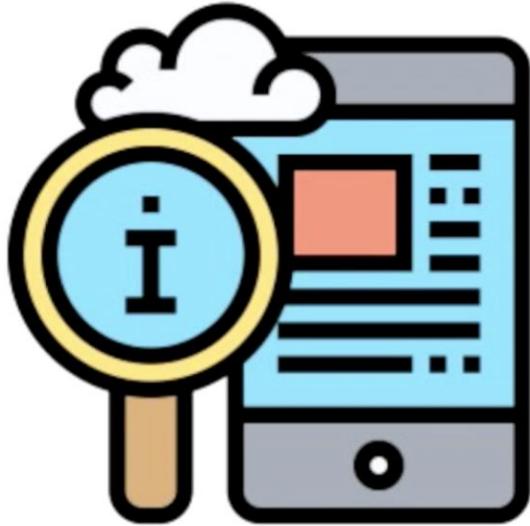
Rester entre cardiologues là où un minorité des électrisés graves y sont admis

Use of troponin assay after electrical injuries: a 15-year multicentre retrospective cohort in emergency departments

Delphine Douillet^{1,2*} , Stéphanie Kalwant³, Yara Amro¹, Benjamin Gicquel³, Idriss Arnaudet³,
Dominique Savary^{1,2,3,4,5}, Quentin Le Bastard^{3,4} and François Javaudin^{3,4}



785 sujets

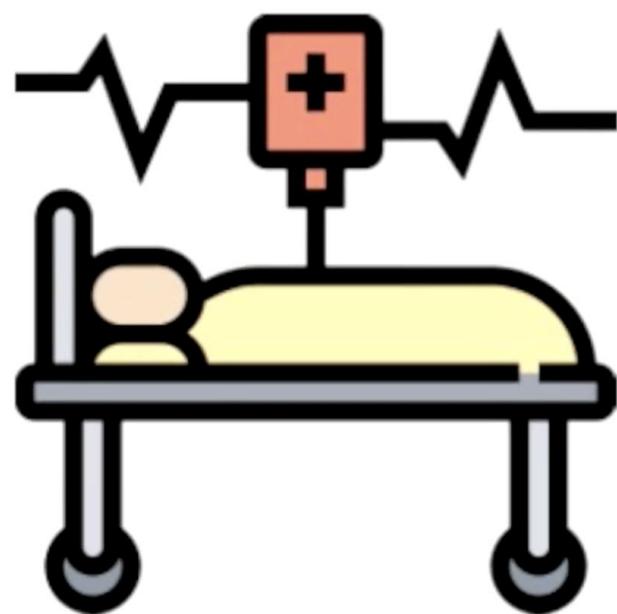


- Absence d'antécédants cardiaques
- Électrisation avec voltage de moins de 1000 volts
- Absence de perte de connaissance initiale
- ECG normal

4 Items cliniques

Excluent avec une valeur prédictive et une sensibilité de 100% la **survenue d'évènements cardiaques majeurs** suite à une électrisation!!

Patients à risque (25%)



- Surveillance scopée de 6H aux urgences
- Dosage troponine de h0 et h6

En cas d'anomalie:

- Transfert en soins continus

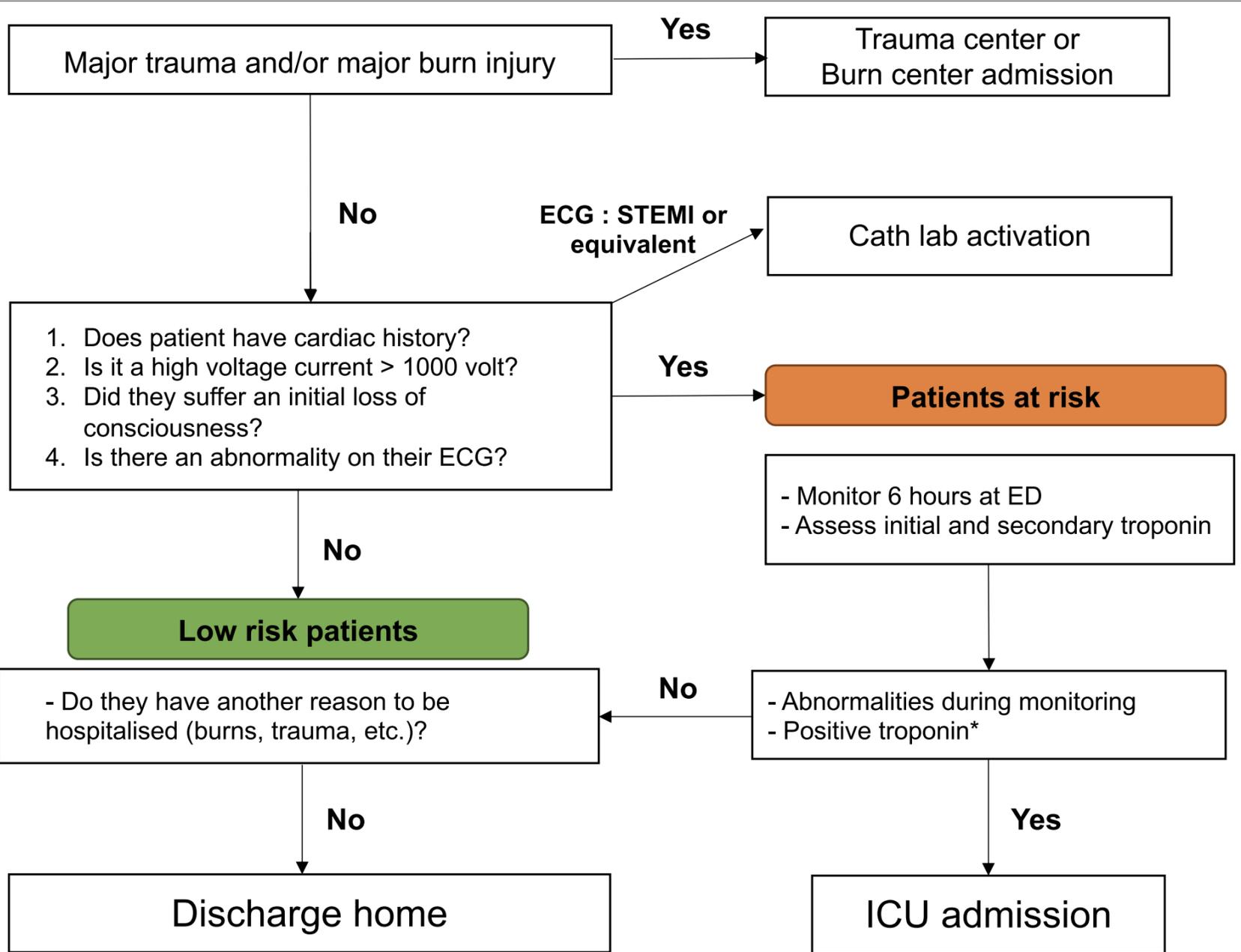
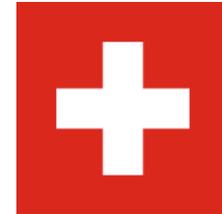


Fig. 2 Flowchart for a standard protocol for patients with electrical injury (based on the paper by Waldmann et al. [1]). *No prospective data available, a procedure in line with the acute coronary syndrome is recommended: follow-up 12-channel ECG, troponin after 6 h and, if necessary, after 12–24 h (ERC)

Outcomes of electrical injuries in the emergency department: a 10-year retrospective study

Andrea M. Pawlik^a, Alina Lampart^a, Frank P. Stephan^{a,c}, Roland Bingisser^a,
Wolfgang Ummenhofer^b and Christian H. Nickel^a



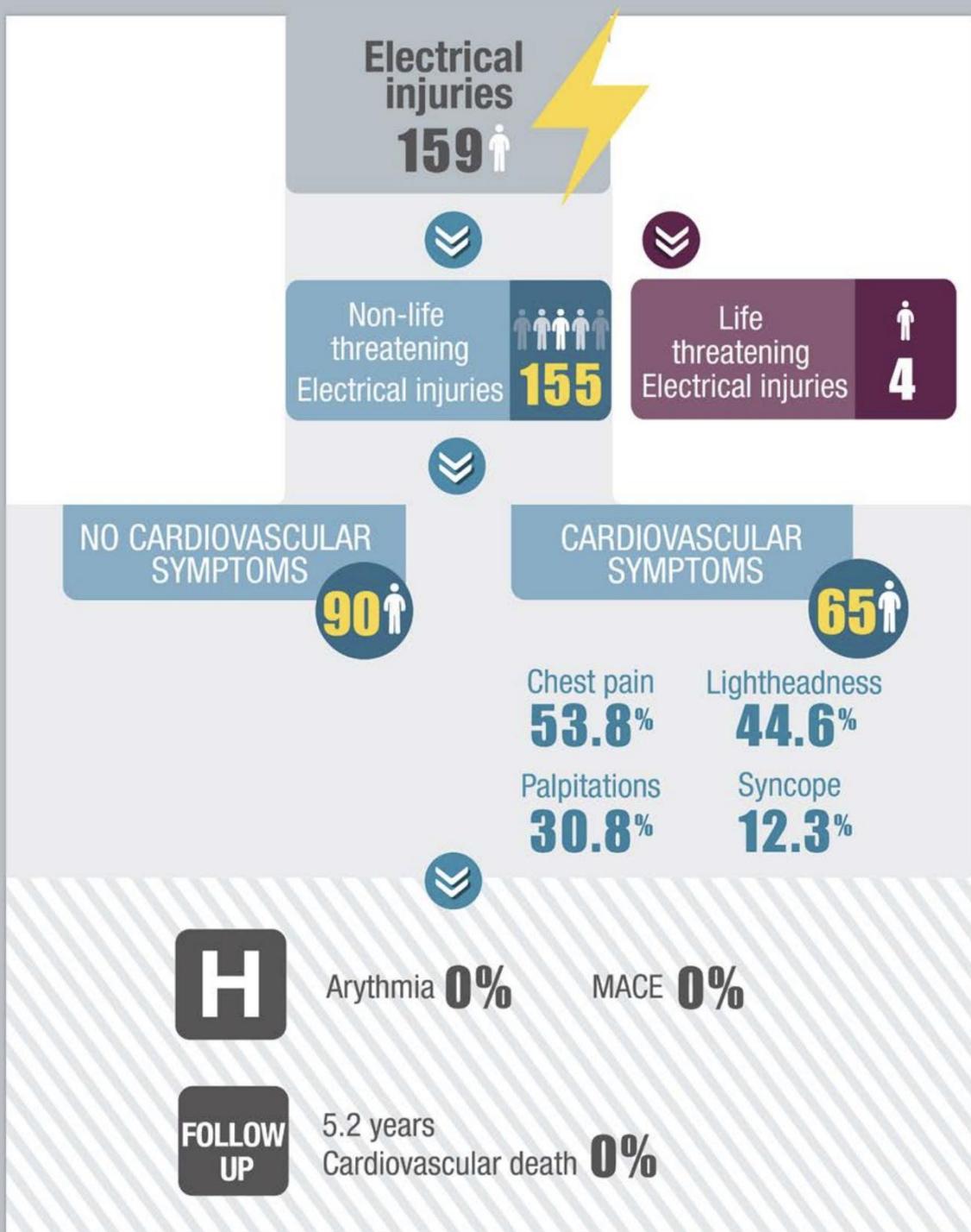
240 sujets

No cardiac complications occurred during ED stay or during the 90-day follow-up period. Therefore, the need for continued cardiac monitoring after electrical injury is not supported by our data.

Impact of cardiovascular symptoms on short- and long-term prognosis after nonlife-threatening electrical injuries

Anne Guerin^a, Nicolas Peschanski^b, Marc Bedossa^a,
Guillaume Leurent^a and Raphaël P. Martins^a, ^aDepartment of Cardiology, Univ
Rennes, CHU Rennes, Inserm, LTSI - UMR 1099 and ^bEmergency Department,
CHU Rennes, Rennes, France



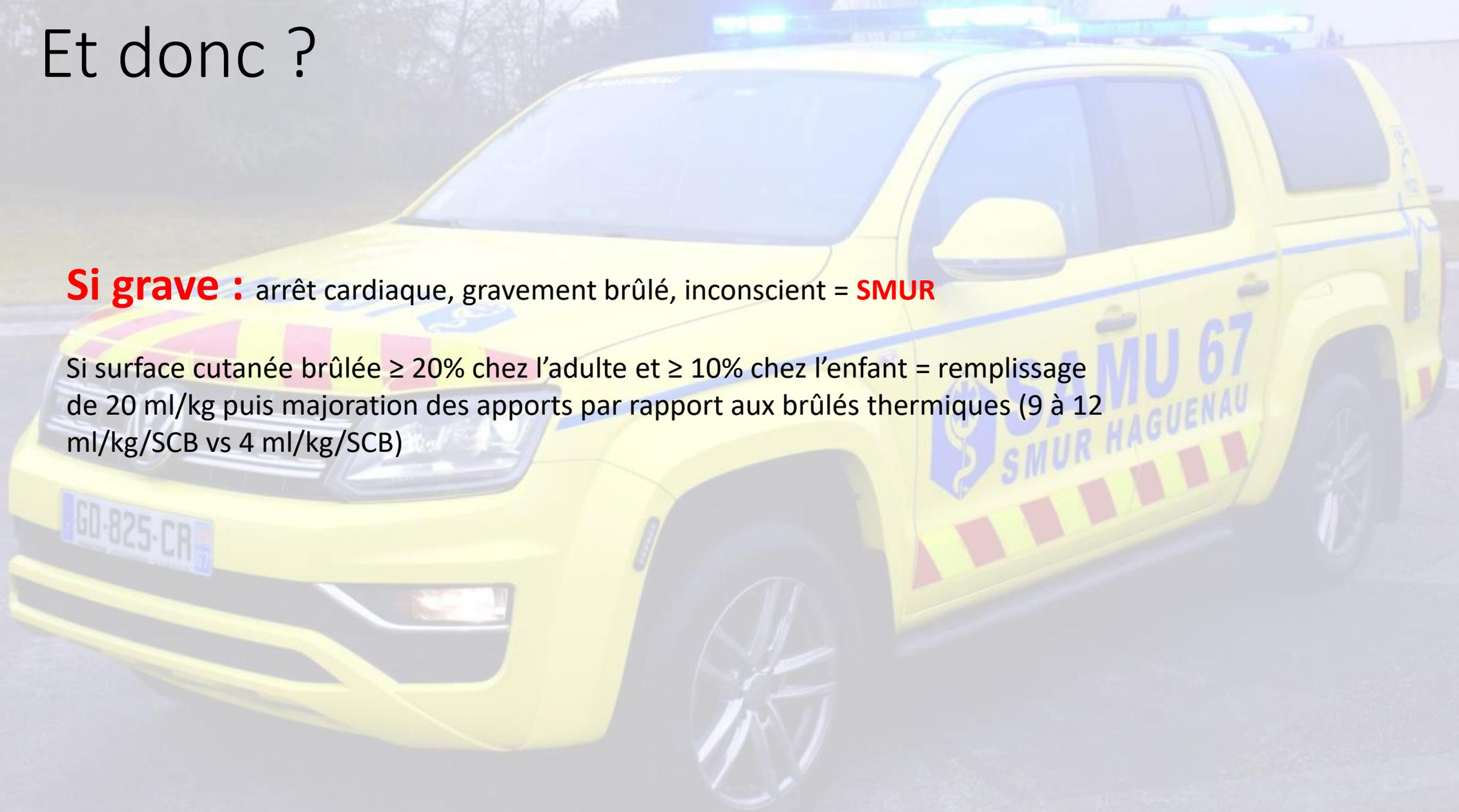


Systematic emergency admission, as well as systematic cardiac monitoring, may not seem relevant.

Et donc ?

Si grave : arrêt cardiaque, gravement brûlé, inconscient = **SMUR**

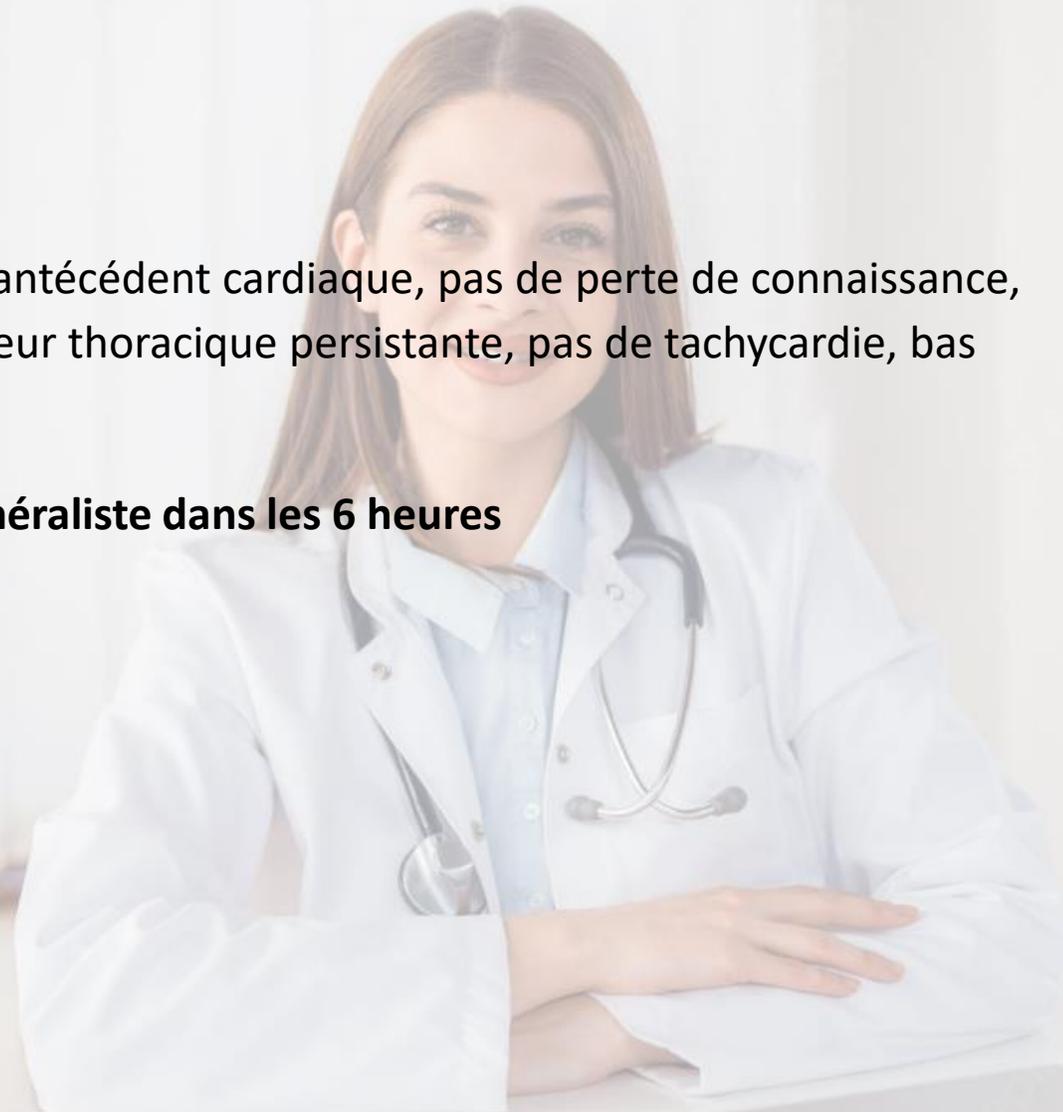
Si surface cutanée brûlée $\geq 20\%$ chez l'adulte et $\geq 10\%$ chez l'enfant = remplissage de 20 ml/kg puis majoration des apports par rapport aux brûlés thermiques (9 à 12 ml/kg/SCB vs 4 ml/kg/SCB)



Et donc ?

Si pas grave : pas d'antécédent cardiaque, pas de perte de connaissance, pas de brûlure, pas de douleur thoracique persistante, pas de tachycardie, bas voltage (<1000 volts)

= consultation médecin généraliste dans les 6 heures



Et donc ?

Si grave mais pas trop : service d'accueil des urgences

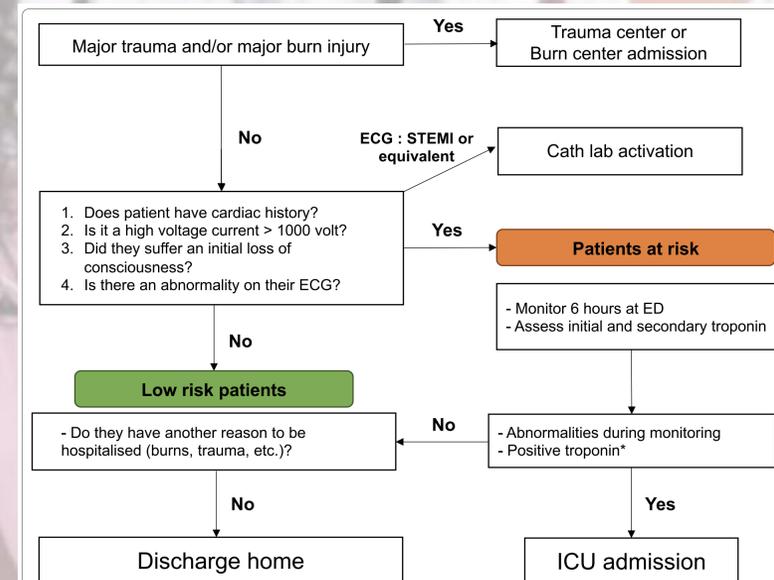
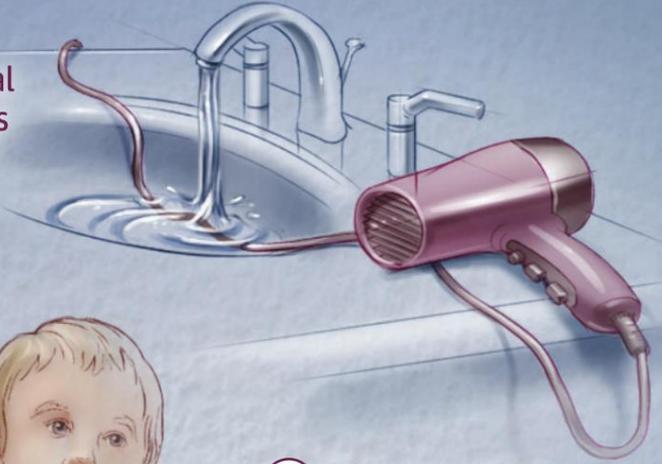


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Prevention of Electrical Injury

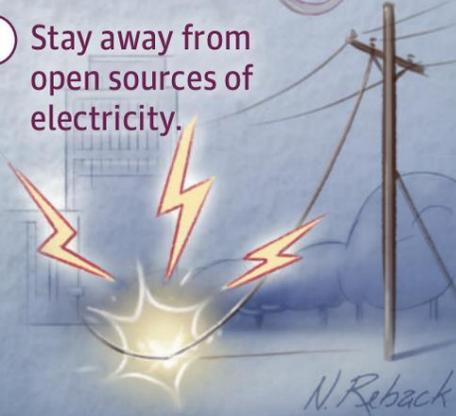
1 Never put electrical appliances or cords in or near water.



2 Keep young children away from electrical cords and cover unused outlets with safety plugs.



3 Stay away from open sources of electricity.



+ Seek immediate medical attention if any of the following symptoms occur after an electrical injury:



Confusion, disorientation, loss of consciousness



Cramps, involuntary muscle contractions



Chest pain, heart palpitations

