(Potentiële) **belangenverstrengeling**	**Geen**
Voor bijeenkomst mogelijk relevante relaties met bedrijven	•Geen
•Sponsoring of onderzoeksgeld •Honorarium of andere (financiële) vergoedingen •Aandeelhouder •Andere relatie	•Geen •Geen •Geen •Geen

Prehospitale reanimatie van patiënten met een hartstilstand na trauma

Joost Peters | traumachirurg - MMT arts

Radboudumc

Prehospitale reanimatie van patiënten met een hartstilstand na stomp trauma is zinloos (?)

Radboudumc

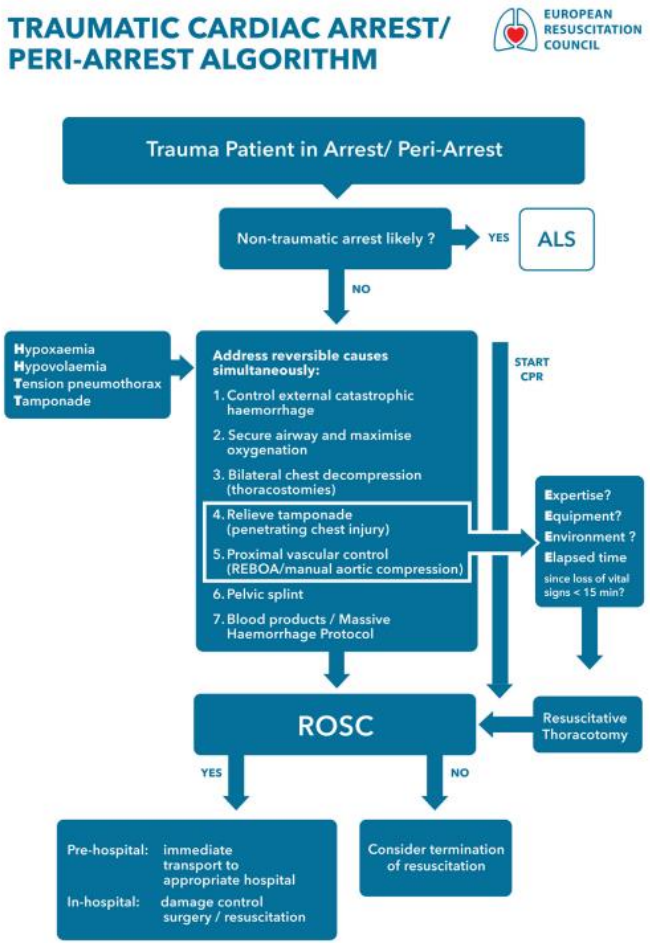
Stomp versus scherp?

Scherp; steekwond of schotwond?

Initieel ritme? Echobeeld?

Reanimatie = BLS

ERC


TRAUMATIC CARDIAC ARREST/
PERI-ARREST ALGORITHM
EUROPEAN RESUSCITATION COUNCIL
Trauma Patient in Arrest/ Peri-Arrest
Non-traumatic arrest likely ?
YES
ALS
NO
Hypoxaemia
Hypovolaemia
Tension pneumothorax
Tamponade
Address reversible causes simultaneously:
1. Control external catastrophic haemorrhage
2. Secure airway and maximise oxygenation
3. Bilateral chest decompression (thoracostomies)
4. Relieve tamponade (penetrating chest injury)
5. Proximal vascular control (REBOA/manual aortic compression)
6. Pelvic splint
7. Blood products / Massive Haemorrhage Protocol
START CPR
Expertise?
Equipment?
Environment ?
Elapsed time
since loss of vital signs < 15 min?
ROSC
Resuscitative Thoracotomy
YES
NO
Pre-hospital: immediate transport to appropriate hospital
In-hospital: damage control surgery / resuscitation
Consider termination of resuscitation


H
HAEMORRHAGE
IN THE RESUS ROOM, YOU ARE LIMITED IN WHAT YOU CAN REVERSE.....
IT'S JUST BUYING TIME UNTIL YOU CAN STOP THE BLEEDING
O
OXYGENATION
INTUBATE THE PATIENT
T
TENSION
TREAT/RULE OUT TENSION PNEUMOTHORACES BY PERFORMING THORACOSOTMIES, ENSURE THE LUNGS ARE UP
T
TAMPONADE
IF THERE IS EVIDENCE OF TAMPONADE IN BLUNT TRAUMA OR SUSPECTED TAMPONDE IN PENETRATING TRAUMA, CONSIDER DOING CLAM-SHELL THORACOTOMY

Duwen op leeg hart?

Duwen zonder O2?

Duwen tegen weerstand?

Duwen zonder vullen/output?


MET 10 STAARTSTICKERS
EZELTJE PRIK
CLOWN GAMES
Wie plakt de staart op de juiste plek?
Hét kinderpartijtje spel
4+
2 10
KIDS


TOO HOT TO HANDLE

NRR 2021

Richtlijn Specialistische Reanimatie Volwassenen

Bijzondere omstandigheden

Onafhankelijk van de oorzaak van een circulatiestilstand zijn de belangrijkste interventies universeel en volgens de keten van overleving. Het aangeleerde ALS-protocol is hier leidend. Er zijn echter een aantal bijzondere omstandigheden waarin dit protocol aanpassingen of aanvullingen behoeft. De belangrijkste hiervan worden hieronder kort besproken. Voor achtergrond van de aanpassingen en de volledige lijst van een circulatiestilstand in bijzondere omstandigheden verwijzen wij naar de geldende ERC-richtlijn 2021 'cardiac arrest in special circumstances'.

Traumatische circulatiestilstand

Het is erg belangrijk om duidelijkheid te krijgen over de omstandigheden van het ongeval, omdat in sommige gevallen de circulatiestilstand primair een niet-traumatische oorzaak heeft. Een traumatische circulatiestilstand heeft een hoge mortaliteit en wordt voornamelijk veroorzaakt door een selectie van de reversibele oorzaken, te weten hypovolemie (48%), hypoxie/asfyxie (13%), spanningspneumothorax (13%) en harttamponade (10%). Snelle diagnostiek (bijvoorbeeld echografie) en gelijktijdige behandeling (bijvoorbeeld wondcompressie, bekkenband, tourniquet, bloedtransfusie, stollingscorrectie, thoracostomie en/of thoracotomie) is noodzakelijk. Vroegtijdig betrekken van een hierin bekwame zorgverlener is belangrijk. Behandeling van een reversibele oorzaak heeft prioriteit boven thoraxcompressies.

Hypothermie

Hypothermie is een lichaamstemperatuur < 35 °C, welke zowel primair (door koude buitentemperatuur) als secundair (door verstoorde thermoregulatie) kan ontstaan. Een ernstig hypotherme patiënt kan dood lijken, maar nog steeds overleven na resuscitatie. Het is gunstig voor de kansen op neurologisch herstel wanneer hypothermie voorafgegaan is aan hypoxie. Wanneer een circulatiestilstand optreedt als gevolg van hypothermie, dient het ALS-protocol continu te worden aangepast op de (door actieve en passieve opwarming veranderende) temperatuur. Monitoring van de kerntemperatuur is derhalve essentieel. Bij een kerntemperatuur van 30-35 °C worden de intervallen van medicatietoediening verdubbeld. Bij een kerntemperatuur < 30 °C wordt geen medicatie gegeven. Bovendien worden maximaal drie defibrillatie-schokken toegediend totdat de temperatuur > 30 °C is gestegen. Wanneer de temperatuur > 30 °C is gestegen worden pogingen pas hervat. Extracorporele Life Support (ECLS) wordt gezien als de meest optimale opwarmingstechniek in deze context.

ORIGINAL ARTICLE

Prehospital traumatic cardiac arrest: a systematic review and meta-analysis

Niek Johannes Vianen[1] · Esther Maria Maartje Van Lieshout[1] · Iscander Michael Maissan[2] · Wichor Matthijs Bramer[3] · Dennis Den Hartog[1] · Michael Herman Jacob Verhofstad[1] · Mark Gerrit Van Vledder[1]

Received: 7 December 2021 / Accepted: 23 February 2022 / Published online: 25 Marc

Abstract

Background Circulatory arrest after trauma is a life-threatening situa
tematic review and meta-analysis on prehospital traumatic cardiac arr
rate for prehospital TCA, to investigate the impact of the time of patie
on TCA mortality rates and neurological outcome, and to investigate
prehospital TCA mortality.

Methods This review was conducted in accordance with the PRISM
for primary studies published about prehospital TCA patients (1995–
categories. Data were analyzed using MedCalc, Review Manager, M
software.

Results Thirty-six studies involving 51.722 patients were included.
neurological outcome was seen in 43.5% of the survivors. Mortality r
and 92.3% in studies excluding prehospital deaths. Favorable neurol
prehospital deaths and 49.5% in studies excluding prehospital deaths.
able at the prehospital scene and 93.9% if a physician was available.
physician was available on scene and 38.0% if no physician was avail
a higher mortality (RR 1.12, $p=0.06$).

Conclusion Approximately 1 in 20 patients with prehospital TCA wi
rological outcome.

ELSEVIER

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Outcomes after Prehospital Traumatic Cardiac Arrest in the Netherlands: a Retrospective Cohort Study

Thymen Houwen[a], Zar Popal[b], Marcel A.N. de Bruijn[c], Anna-Marie R. Leemeyer[a], Joost H. Peters[c], Maartje Terra[b], Esther M.M. van Lieshout[a], Michael H.J. Verhofstad[a], Mark G. van Vledder[a,*]

[a] *Trauma Research Unit, Department of Surgery, Erasmus MC, University Medical Center Rotterdam, P.O. Box 2040, 3000, CA, Rotterdam, The Netherlands*
[b] *Department of Trauma Surgery, Amsterdam University Medical Center (Amsterdam UMC, location VUmc), De Boelelaan 1117, 1081 HV, Amsterdam, The Netherlands*
[c] *Department of Trauma Surgery, Radboud University Medical Center, Geert Grooteplein Zuid 10, 6525, GA, Nijmegen, The Netherlands*

- Meta analyse van 51.722 patiënten met TCA, internationaal
- Mortaliteit van 97.2%, beter bij HEMS aanwezigheid 93.9%
- Goede neurologie 38%, met HEMS 68%
- Betere kans bij ritme ≠ asystolie

- NL studie 2021, n = 915
- ROSC 28.5% -> 3.9% overleeft -> 1.8% goede uitkomst …
- Gunstige factoren:
  - <70 jaar
  - Schokbaar ritme

- Andere gunstige factoren op overleven:
  - Hartactie op FAST
  - Witnessed Arrest
  - Scherp (geen schotwond) letsel

- Penetrerend/scherp letsel

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Injury

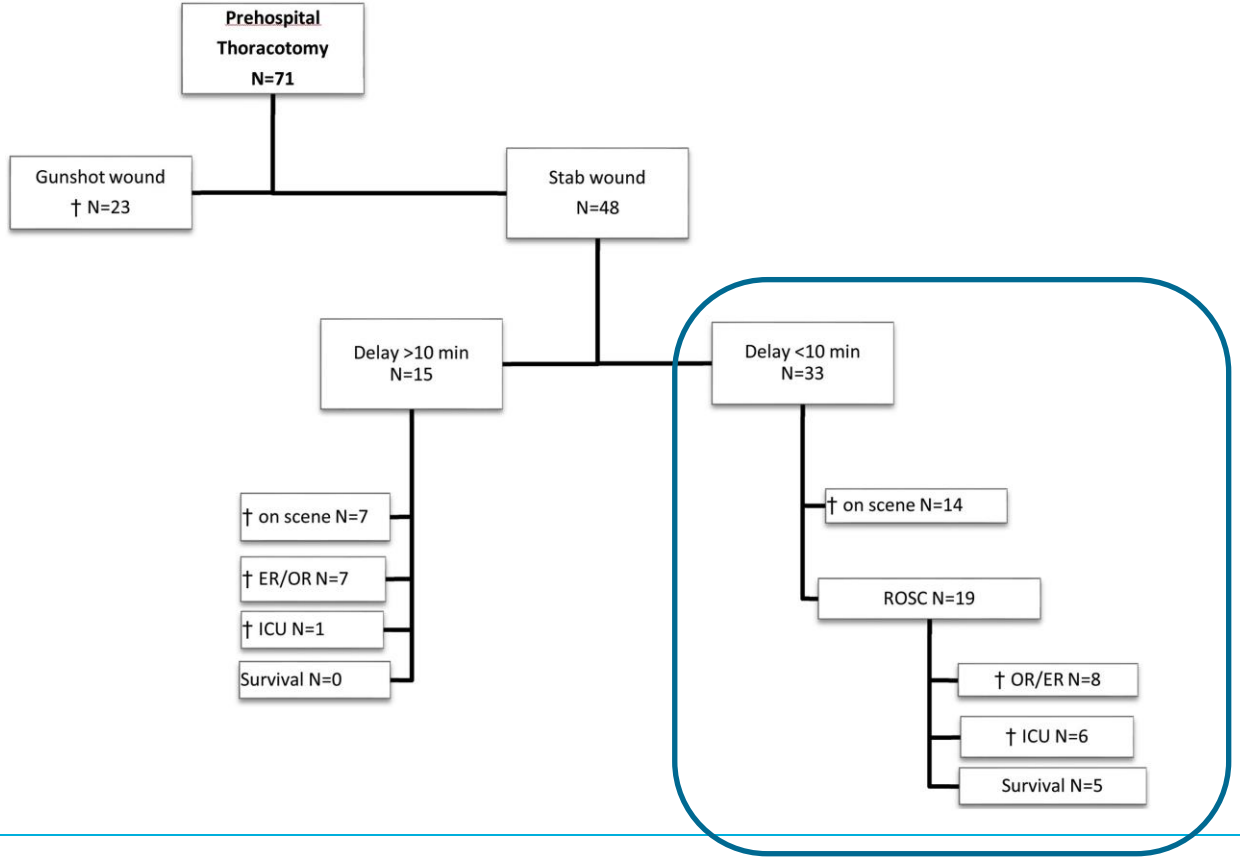
Volume 48, Issue 9, September 2017, Pages 1865-1869

Full length article

Out of hospital thoracotomy for cardiac arrest after penetrating thoracic trauma

Mark G. Van Vledder [a], Oscar J.F. Van Waes [a], Fabian O. Kooij [b], Joost H. Peters [c], Esther M.M. Van Lieshout [a], Michael H.J. Verhofstad [a]

Show more


Prehospital
Thoracotomy
N=71
Gunshot wound
† N=23
Stab wound
N=48
Delay >10 min
N=15
Delay <10 min
N=33
† on scene N=7
† ER/OR N=7
† ICU N=1
Survival N=0
† on scene N=14
ROSC N=19
† OR/ER N=8
† ICU N=6
Survival N=5

- Schotwonden gaan ip dood

- Steekwond:
  - Binnen 10 minuten
  - Ontlasten tamponade / stelpen longbloeding

  - 15.5% overleving (allemaal goede neurologie)

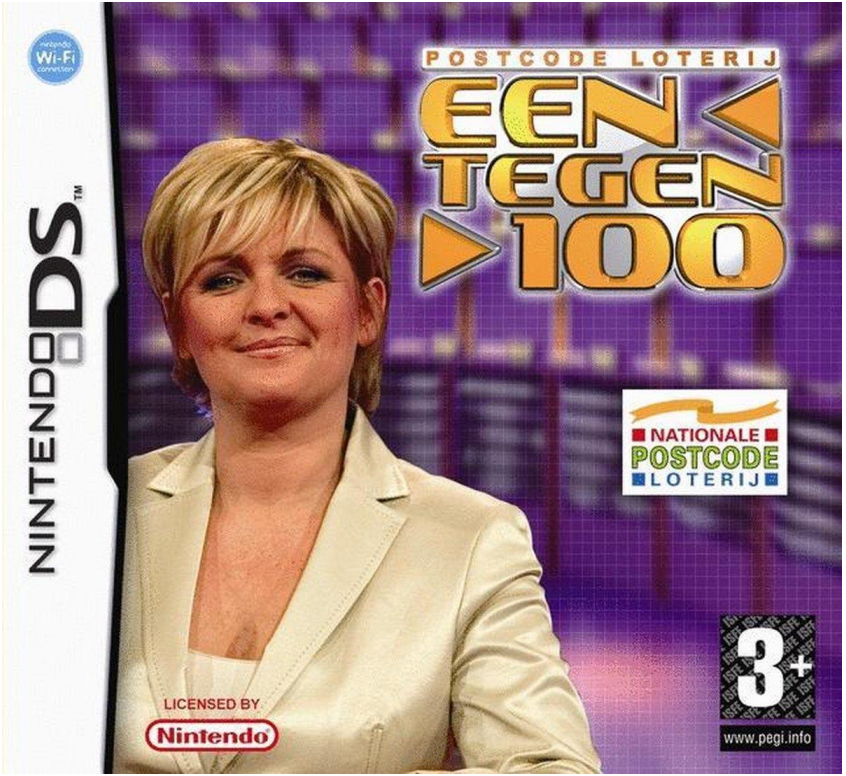

VINDT U HET HEEL ERG ALS IK HIER EFFE GEEN ENERGIE IN GA STEKEN ?...

TCA in breder perspectief…

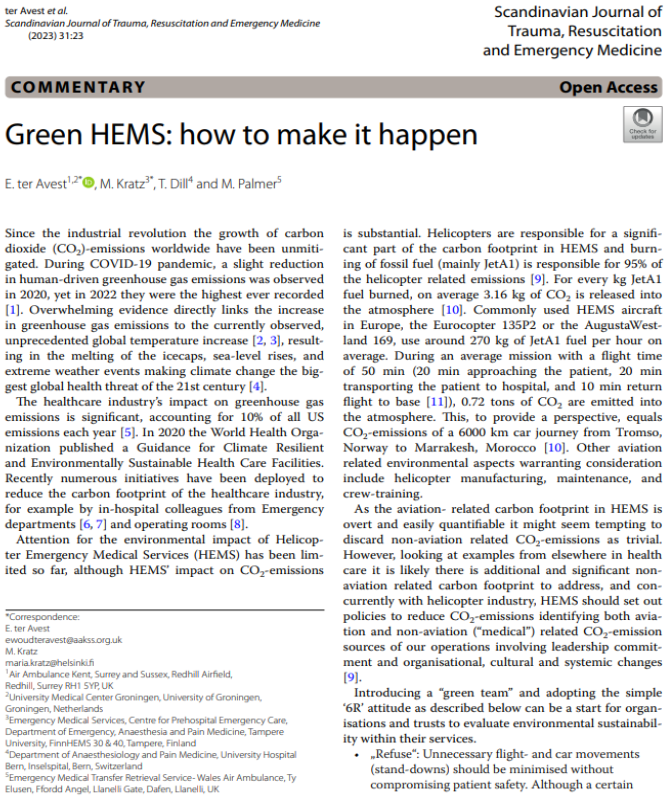
- 51.722 TCA
- 97.2% gaat dood! (50.273 -> 1449)
- Slechte neurologie 64.2%
- Overlever en “goede” neurologie; 1%.....
- 100 keer vliegen om er 1 te “redden”

- 6.000.000/1500 pt ≈ 4000 euro per pt contact
- ±4000 x 99 = ±396.000 euro
- Qaly??

- Niet schokbaar nog slechter!
- En slechte neurologie, IC (40.000 euro per opname, verpleeghuis etc…)



- Treurnis, zeker als geen VF, oud en FAST-
- Beter als HEMS erbij… maar



ter Avest *et al.*
Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine
(2023) 31:23

Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine

COMMENTARY Open Access

Green HEMS: how to make it happen

E. ter Avest[1,2*], M. Kratz[3*], T. Dill[4] and M. Palmer[5]

Since the industrial revolution the growth of carbon dioxide (CO_2)-emissions worldwide have been unmitigated. During COVID-19 pandemic, a slight reduction in human-driven greenhouse gas emissions was observed in 2020, yet in 2022 they were the highest ever recorded [1]. Overwhelming evidence directly links the increase in greenhouse gas emissions to the currently observed, unprecedented global temperature increase [2, 3], resulting in the melting of the icecaps, sea-level rises, and extreme weather events making climate change the biggest global health threat of the 21st century [4].

The healthcare industry's impact on greenhouse gas emissions is significant, accounting for 10% of all US emissions each year [5]. In 2020 the World Health Organization published a Guidance for Climate Resilient and Environmentally Sustainable Health Care Facilities. Recently numerous initiatives have been deployed to reduce the carbon footprint of the healthcare industry, for example by in-hospital colleagues from Emergency departments [6, 7] and operating rooms [8].

Attention for the environmental impact of Helicopter Emergency Medical Services (HEMS) has been limited so far, although HEMS' impact on CO_2-emissions is substantial. Helicopters are responsible for a significant part of the carbon footprint in HEMS and burning of fossil fuel (mainly JetA1) is responsible for 95% of the helicopter related emissions [9]. For every kg JetA1 fuel burned, on average 3.16 kg of CO_2 is released into the atmosphere [10]. Commonly used HEMS aircraft in Europe, the Eurocopter 135P2 or the AugustaWestland 169, use around 270 kg of JetA1 fuel per hour on average. During an average mission with a flight time of 50 min (20 min approaching the patient, 20 min transporting the patient to hospital, and 10 min return flight to base [11]), 0.72 tons of CO_2 are emitted into the atmosphere. This, to provide a perspective, equals CO_2-emissions of a 6000 km car journey from Tromso, Norway to Marrakesh, Morocco [10]. Other aviation related environmental aspects warranting consideration include helicopter manufacturing, maintenance, and crew-training.

As the aviation- related carbon footprint in HEMS is overt and easily quantifiable it might seem tempting to discard non-aviation related CO_2-emissions as trivial. However, looking at examples from elsewhere in health care it is likely there is additional and significant non-aviation related carbon footprint to address, and concurrently with helicopter industry, HEMS should set out policies to reduce CO_2-emissions identifying both aviation and non-aviation ("medical") related CO_2-emission sources of our operations involving leadership commitment and organisational, cultural and systemic changes [9].

Introducing a "green team" and adopting the simple '6R' attitude as described below can be a start for organisations and trusts to evaluate environmental sustainability within their services.

- „Refuse": Unnecessary flight- and car movements (stand-downs) should be minimised without compromising patient safety. Although a certain

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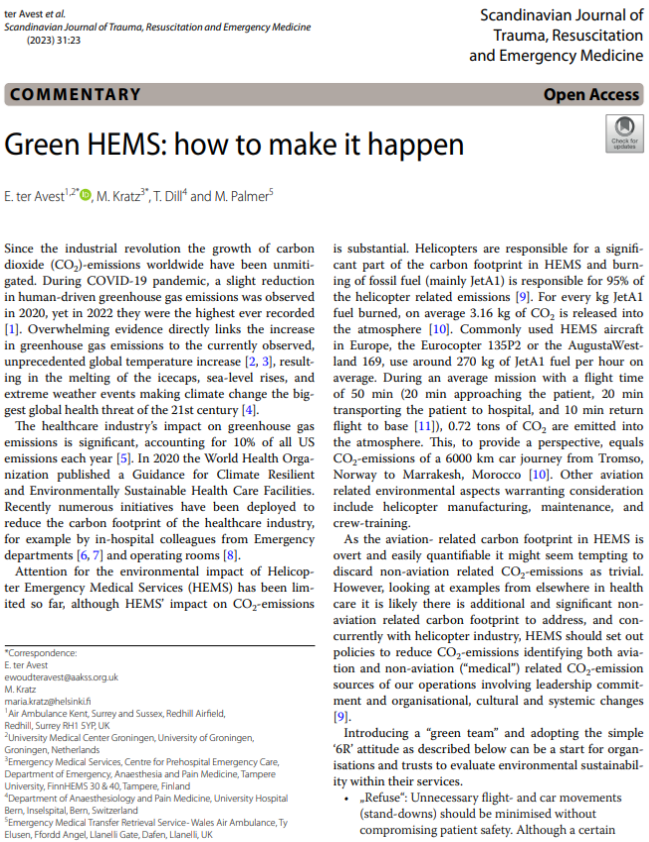
[2]University Medical Center Groningen, University of Groningen, Groningen, Netherlands
[3]Emergency Medical Services, Centre for Prehospital Emergency Care, Department of Emergency, Anaesthesia and Pain Medicine, Tampere University, FinnHEMS 30 & 40, Tampere, Finland
[4]Department of Anaesthesiology and Pain Medicine, University Hospital Bern, Inselspital, Bern, Switzerland
[5]Emergency Medical Transfer Retrieval Service- Wales Air Ambulance, Ty Elusen, Ffordd Angel, Llanelli Gate, Dafen, Llanelli, UK

- $C0_2$, gezondheidzorg 9-10%
- 1 kg JetA1 (kerosine) = 3.16 kg $C0_2$
- 270 kg JetA1 per uur, (H-135P2)
- Gemiddelde inzet (2x25min): 0,72 ton $C0_2$



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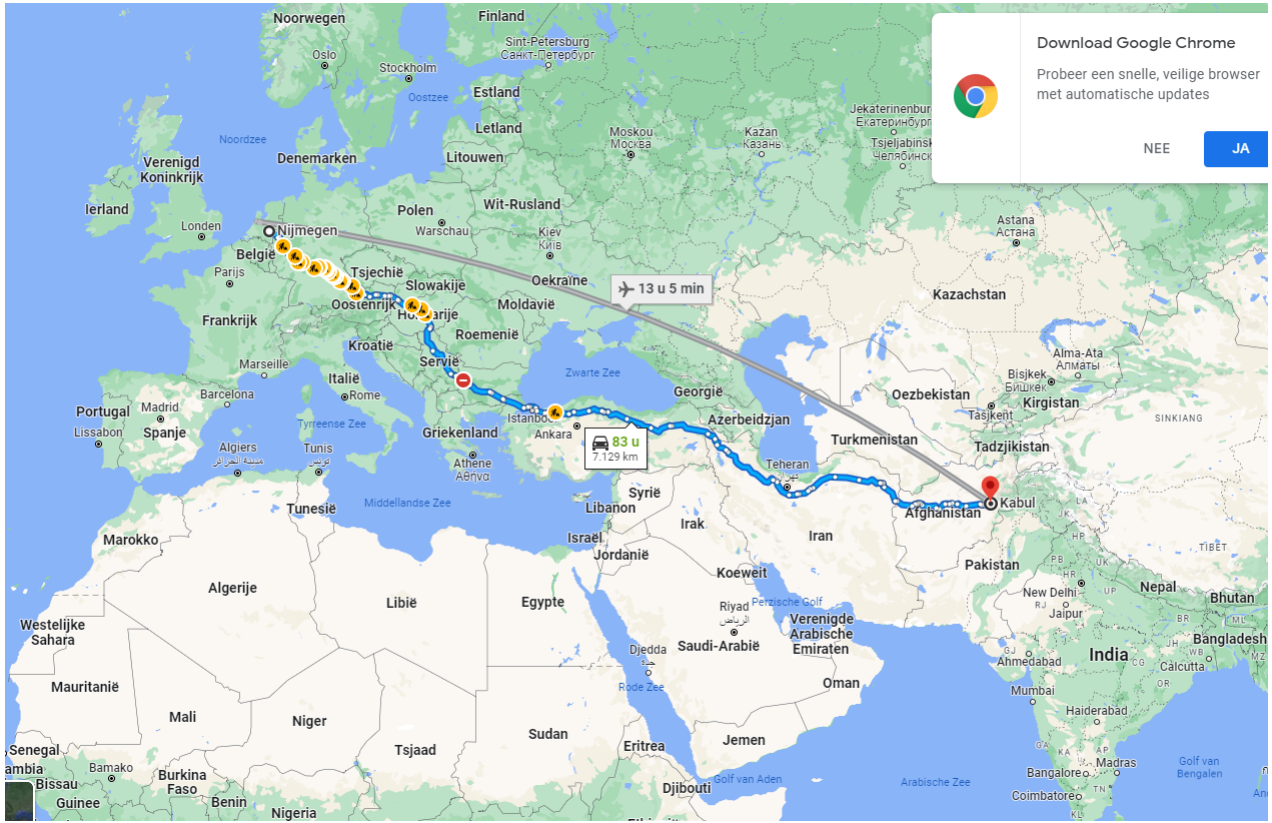
Radboudumc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NEE
JA
Nijmegen
13 u 5 min
83 u
7.129 km
Kabul
Noorwegen
Finland
Sint-Petersburg
Oslo
Stockholm
Estland
Letland
Litouwen
Moskou
Kazan
Verenigd Koninkrijk
Denemarken
Ierland
Polen
Wit-Rusland
Warschau
Kiev
België
Parijs
Tsjechië
Slowakije
Oekraïne
Moldavië
Frankrijk
Roemenië
Kroatië
Servië
Zwarte Zee
Georgië
Azerbeidzjan
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Tasjkent
Tadzjikistan
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Syrië
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Pakistan
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Algiers
Tunis
Tunesië
Middellandse Zee
Marokko
Israël
Jordanië
Koeweit
Riyad
Perzische Golf
Verenigde Arabische Emiraten
Saudi-Arabië
Djedda
Rode Zee
Oman
Algerije
Libië
Egypte
Westelijke Sahara
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Mali
Niger
Tsjaad
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India
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Bangalore
Madras
Coimbatore
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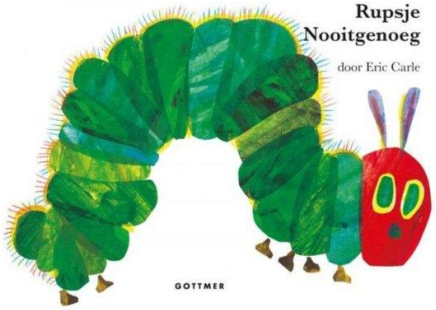
Nepal
Bhutan
Bangladesh
Senegal
Bissau
Guinee
Bamako
Burkina Faso
Benin
Nigeria

Radboudumc

- 6 maanden stroom verbruik gemiddeld huishouden
- 52 enkele reizen Thalys naar Parijs
- 1.8x Economy Class naar Rome
- 355 Brandblussers leegspuiten
- 35 bomen een jaar groeien

Zinvolheid van zorg…




Dank
voor
jullie
aandacht.
WBVB
tegelizr.nl