CRPS I
... suits me perfectly ...
… "really" …?

REHA Congress 2025, Congress Centre, Aarau
SPS – Congress 2025

REHAB MEETS PAIN MEETS REHAB

PD Dr. med. François Luthi, Musculoskeletal Rehabilitation Department, CRR, Sion

suvaclinics

Dear Mr Luthi,

The provisional title of your presentation is "CRPS 1": would you like to keep this title or would you like to change it?

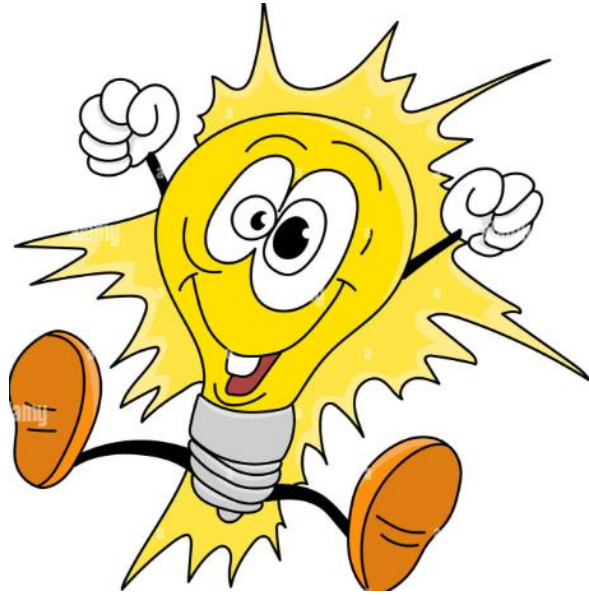
Hello and thank you for your message.

The title "CRPS 1" suits me perfectly.

Weeks go by, and I forget about this exchange... But one day, a colleague says to me over coffee: I saw that you were speaking at the Swiss Congress... but your title is a bit strange...

???

09.30 – 11.00	**Session 1 - Chronic Pain**	
	Pain resolution in complex regional pain syndrome	Heike Rittner
	CRPS I me convient parfaitement	François Luthi
	Mechanism-orientated Physiotherapy in CRPS	Evelyn Bärtschi



I suggest we answer the question...

Does the CRPS 1 diagnosis (without documented neurological damage) fit entirely?

→ Consider the strengths and weaknesses of the diagnostic criteria (Budapest)

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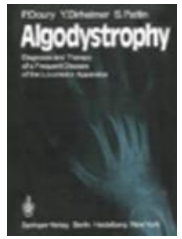
CRPS: misunderstandings and differences are nothing new

SOME FORERUNNERS

- Ambroise Paré and King Charles IX
- Denmark and the siege of Badajoz (Spanish War of 1811)
- Mitchell and the American Civil War
- Sudeck and the beginnings of radiology

Doury's criteria (rheumatologist)

- Localised pain, hyperaesthesia
- Vasomotor disorders, oedema, asymmetry T°
- Limited active ROM
- **Scintigraphy/X-ray +**
- **No signs of inflammation (lab)**
- **Positive response to treatment**



1994-8: initial criteria – Orlando – IASP (sp ↓)

> 20 different names...

- **Sudeck's disease**
- **Algo(neuro)dystrophy**
- **Reflex Sympathetic Dystrophy**

1984: Complex Regional Pain Syndrome
***(description, without aetiopathogenic reference, validation)* - IASP**

Atkins criteria (orthopaedic surgeon)

- Regional neuropathic pain
- Vasomotor disorders, oedema, sweating
- Motor and trophic disorders
- **Clinical criteria reinforced if: scintigraphy/x-ray +**

Veldman criteria (surgeon)

- Unexplained diffuse pain
- Vasomotor disorders, oedema, asymmetry T°
- Limited active ROM
- Regional nature

2004 -10: Budapest criteria – IASP (se: 0.99 / sp: 0.68)

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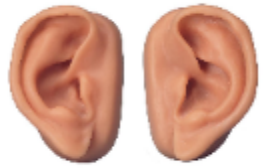
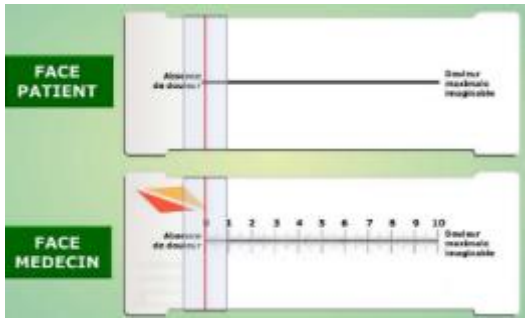
Budapest Criteria (2010) - IASP

Criterion 1: Continuing pain disproportionate to any inciting event event	
Criterion 2: Patient reports ≥ 1 symptom in 3 of the following 4 categories (4/4: research)	
Sensory • Allodynia and/or hyperpathy	**Vasomotor** • Temperature asymmetry and/or colour change/asymmetry
Sudomotor/oedema • Oedema and/or change/asymmetry in sweating	**Motor/trophic** • ↓ mobility and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic disorder (hair, nails, skin)
Criterion 3: patient presents ≥ 1 sign in ≥ 2 of the following categories	
Sensory • Same but observable	**Vasomotor** • Same but observable
Sudomotor/oedema • Same but observable	**Motor/trophic** • Same but observable …
Criterion 4: The diagnosis of CRPS is ruled out by the existence of another diagnosis that could explain the patient's clinical symptoms and signs (i.e no other diagnosis can better explain signs and symptoms)	

Harden RN, 2010

CRPS – Budapest: a clinical diagnosis! ...deliberately validated on the basis of "bedside testing"! ...accessible to any physicians, not requiring any special equipment or training... (Harden 2010)





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Instruction manual…?

IASP

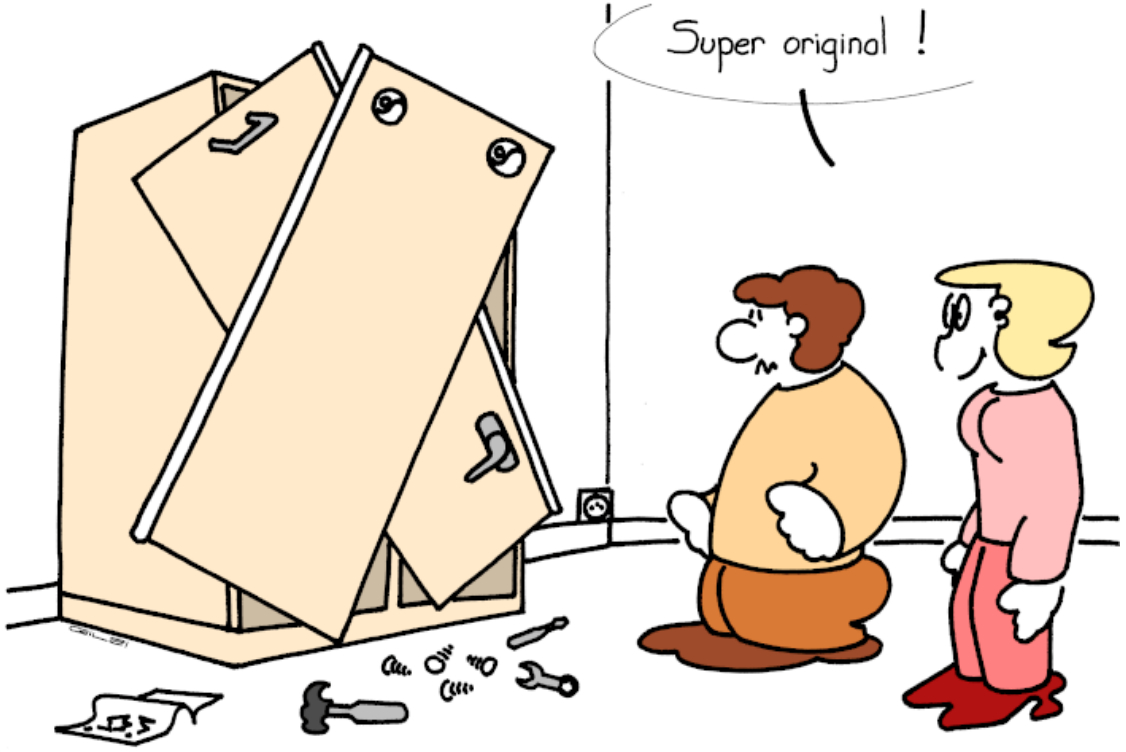
PAIN® 150 (2010) 268–274

PAIN®

www.elsevier.com/locate/pain

Validation of proposed diagnostic criteria (the "Budapest Criteria") for Complex Regional Pain Syndrome

R. Norman Harden [a,*], Stephen Bruehl [b], Roberto S.G.M. Perez [c,d], Frank Birklein [e], Johan Marinus [d,f], Christian Maihofner [g], Timothy Lubenow [h], Asokumar Buvanendran [h], Sean Mackey [i], Joseph Graciosa [a], Mila Mogilevski [a], Christopher Ramsden [a], Melissa Chont [b], Jean-Jacques Vatine [j]



Budapest criteria based on…

- Subjective (response of the patient)
- Moderately objective (impression/experience of the clinician)
- **No Gold Standard**

Pain Medicine

Pain Medicine 2010; 11: 1212–1215
Wiley Periodicals, Inc.

Original Research Articles

Objectification of the Diagnostic Criteria for CRPS

R. Norman Harden, MD

patient history. There is an opportunity to lend more objectivity to this diagnostic set, at least in the research context,

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Efforts needed to improve the instructions for use!

Received: 7 September 2018 | Revised: 3 January 2019 | Accepted: 4 January 2019
DOI: 10.1002/ejp.1362

POSITION PAPER

WILEY EJP European Journal of Pain

Standards for the diagnosis and management of complex regional pain syndrome: Results of a European Pain Federation task force

Andreas Goebel[1,2*] | Chris Barker[1,2*] | Frank Birklein[3] | Florian Brunner[4] | Roberto Casale[5] | Chris Eccleston[6,7,8] | E. Eisenberg[9] | Candy S. McCabe[10] | G. Lorimer Moseley[11] | R. Perez[12] | Serge Perrot[13] | Astrid Terkelsen[14] | Ilona Thomassen[15] | Andrzey Zyluk[16] | Chris Wells[8]

Perspective

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VIDEO OPEN

The Valencia consensus-based adaptation of the IASP complex regional pain syndrome diagnostic criteria

Andreas Goebel[a], Frank Birklein[b], Florian Brunner[c], J. David Clark[d], Janne Gierthmühlen[e], Norman Harden[f], Frank Huygen[g], Lone Knudsen[h], Candy McCabe[i], Jenny Lewis[i,j], Christian Maihöfner[k], Walter Magerl[l], G. Lorimer Moseley[m], Astrid Terkelsen[n], Ilona Thomassen[o], Stephen Bruehl[p]

Standard 1: Budapest diagnostic criteria for CRPS must be used, as they provide **<u>acceptable</u>** sensitivity and specificity

Standard 2: Diagnosing CRPS **<u>does not require</u>** diagnostic tests, **except to exclude other diagnoses**

… so what? … strict minimum!!!

Pain Medicine, 23(S1), 2022, S1–S53
https://doi.org/10.1093/pm/pnac046
Special Article
OXFORD

Complex Regional Pain Syndrome: Practical Diagnostic and Treatment Guidelines, 5th Edition

R. Norman Harden, MD,* Candida S. McCabe, PhD,[‡,‖] Andreas Goebel, MD,[‡] Michael Massey, DO,[¶] Tolga Suvar, MD,** Sharon Grieve, DPhil,[§] and Stephen Bruehl, PhD[†]

Let's go through the criteria one by one...

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Criterion 1: the patient has continuing pain which is disproportionate to any inciting event! The pain is regional

The key criterion = the diagnostic gateway for CRPS (100%)

The criterion most prone to bias/interpretation/misunderstanding!

Subjective (patient): Pain = sensory and emotional experience...

Harden 2022:

CRPS is a syndrome characterised by continuing (**spontaneous and/or evoked**) regional pain that is **seemingly disproportionate** in **time or degree** to the **usual course of any known trauma or other lesion,** according **to the (subjective) opinion of the diagnosing physician.**

Best assessed in a multidisciplinary context (theoretical...), interest: "pain drawing"...

Ott (2018 / n=1043 patients):

- 25%: no spontaneous pain sensation!
- Pain: 5.12 +/-2.26 (moderate: NRS 4-6)

Disproportionate pain (prospective studies/Budapest criteria/early <6 m.)?

	Bean (2016) (n=59)	**Brunner (2017)** (n=35)	**Harden (2017)** (n=107)	**Hofbauer (2024)** (n=40)	**Louis (2025)** (n=113 /13 type 2)	**CRR (2025)** (n=101)
Pain at inclusion	**5.5 ± 2.0**	***7.3 ± 2.3***	**5.9 ± 2.0**	**4.0 ± 2.6**	**4.7 ± 2.3**	**4.3 ± 2.1**

These studies suggest that the average **'disproportionate'** pain for most early CRPS was approximately 5 points +/- 2 on a 10-point NRS (moderate).

Disproportionate does not necessarily mean severe to very severe pain (≥ 7/10)

This makes sense if we remember that:
in most cases, the triggering event occurred several months earlier

The pain is disproportionate **in terms of time or degree**
to the usual course of any known trauma or lesion **(key point)**

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Criterion 2: symptoms (patient)

Must report at least one symptom in three of the four following categories:

Sensory: reports of hyperalgesia **and/or** allodynia

Vasomotor: reports of temperature asymmetry **and/or** skin colour changes **and/or** skin colour asymmetry

Sudomotor/Edema: reports of oedema **and/or** sweating changes **and/or** sweating asymmetry

Motor/Trophic: reports of decreased range of motion **and/or** motor dysfunction (weakness, tremor, dystonia) **and/or** trophic changes (hair, nail, skin)

- **All symptoms must be systematically investigated for each patient!**
- Start with open-ended questions, spontaneous evocation
- Then complete/explain the meaning of the symptoms sought
- Limit: "Mr or Mrs Yes"
- **Document: dedicated form in the patient's file!**

Harden, 2010, Goebel 2021, Harden 2022

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Criterion 3 (signs): the clinician

The same applies (research everything, document everything) to a user manual:

Always **comparative**, **systematic**
The differences must be **obvious** (... clinical judgement...)!

- **Allodynia**: light touch, vibration, cool or warm temperature, pressure, deep tissue pressure, joint movement (**only one is required**)
- **Hyperalgesia**: response to an identical pinprick in the centre of the most affected region
- **Temperature asymmetry**: should be **obvious** to the touch of the dorsum of the hand (examiner)
- **Colour asymmetry**: **obvious** (specify the nature: red, blue, etc.)
- **Sweating asymmetry**: visual (or manual) inspection
- **Oedema:** circumference measurements
- **Trophic changes:** visual inspection (specify)
- **Motor changes:** goniometer
- **Weakness:** M5, JAMAR, etc.

Harden 2010, 2022, Goebel 2021

Criterion 4 (DD): no other diagnosis can better explain the signs and symptoms

- A relative "radio silence"
- "Diagnosing CRPS **does not require** diagnostic tests, **except to exclude other diagnoses..."**
- In other words: IASP and other pain federations trust clinicians' knowledge, experience and rigour!

➢ Does it work? It could! However, "real life" suggests that there may still be some problems

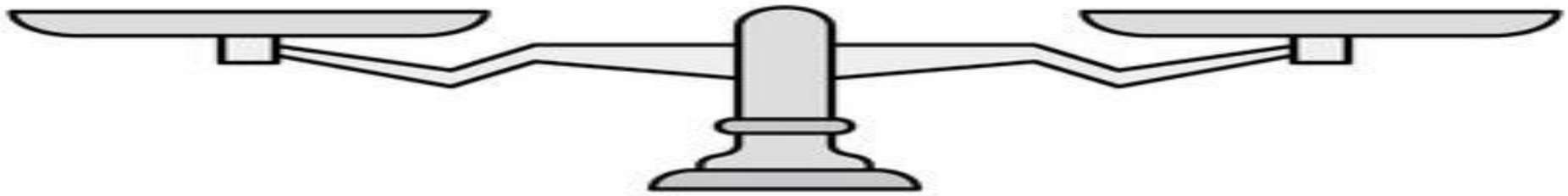
Good or Poor practices?

Poor

- Most Health Practitioners (HPs) do not recognise the condition
- Diagnostic criteria vary between specialists
- **The condition is over-diagnosed**
- **Most HPs do not know how to diagnose CRPS**
- Accurate diagnosis occurs **late or not at all**

Good

- Most Health Practitioners recognise CRPS
- Budapest criteria are routinely being used
- **There is good awareness about differential diagnoses (somatic and psychogenic)**
- Diagnosis is **within a few months of onset**



Goebel 2019

GOOD ? Budapest: Predictive value and clinical utility according to IASP

Diagnostic criteria	se	sp	PPV	NPV	PPV	NPV
			Prevalence 70%		Prevalence 50%	
Budapest Clinic	**0.99**	**0.68**	**0.88**	**0.97**	**0.76**	**0.99**
Budapest search	0.78	0.79	0.90	0.60	0.79	0.78

PPV: se x prev / (se x prev) + {(1-sp) x (1-prev)} ; NPV: sp x (1-prev) / {sp x (1-prev)} + {(1-sens) x prev}

According to IASP:

- Significant progress compared to 1994 subjective criteria √ (↓ > 50% "CRPS prevalence")
- Very good PPV: 0.76 / Excellent NPV: 0.99
- Clinically applicable √

So all is well in the best of all possible worlds!
The Budapest criteria for the diagnosis of CRPS are perfectly adequate!!!

Harden RN, 2010

Unfortunately, the devil is in the details (POOR!)

The Budapest criteria were validated in a specific context (i.e adapted to this context!):

- Pain Clinics, Tertiary centres
- Chronic CRPS (14.2 months)
- Controls: poorly matched (≠ gender, age, pain duration, affected extremity ($p<0.01$))

➢ Others: se 0.45-0.99 / sp 0.68-0.85 …

- PPV/NPV: assuming a CRPS prevalence ≥ 50%

- ≠ “real-life” conditions

➢ **Overestimation of Budapest performance!**

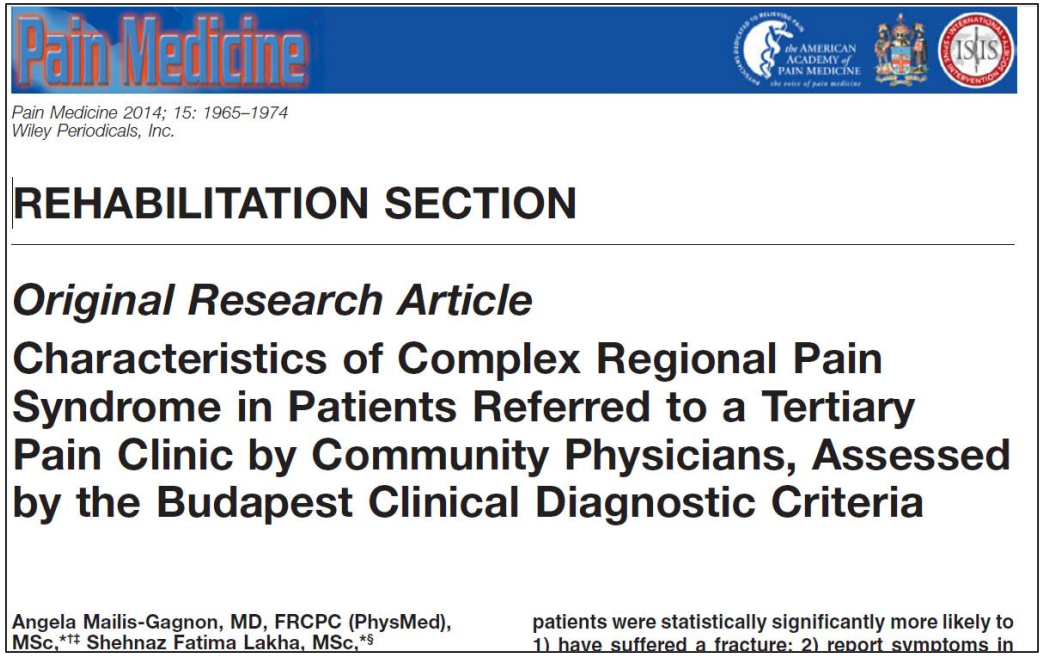
Harden 2010, Mailis-Gagnon 2014, Ott 2018, Sumitani 2010, Oh 2019

Overestimation: Criterion 4 is a Devil !

The diagnosis is incorrect in three-quarters of patients referred for CRPS

- > 80% somatic (2/3 musculoskeletal /~ 1/3 neurological)
- ~ 20% psychiatric pathology (*not always exclusive!)*

- ***Yellow flags:***
  - *Pain that is truly out of proportion (8-10/10)*
  - *Disproportionate disability (invalidation)*
  - *Disproportionate oedema (factitious disorder)*
  - *Dystonia... especially early onset*
  - *Sensory and motor signs...and nothing else*
  - *Spontaneous CRPS*
  - *Proximal CRPS only / CRPS primarily affecting multiple limbs*



Pain Medicine

Pain Medicine 2014; 15: 1965–1974
Wiley Periodicals, Inc.

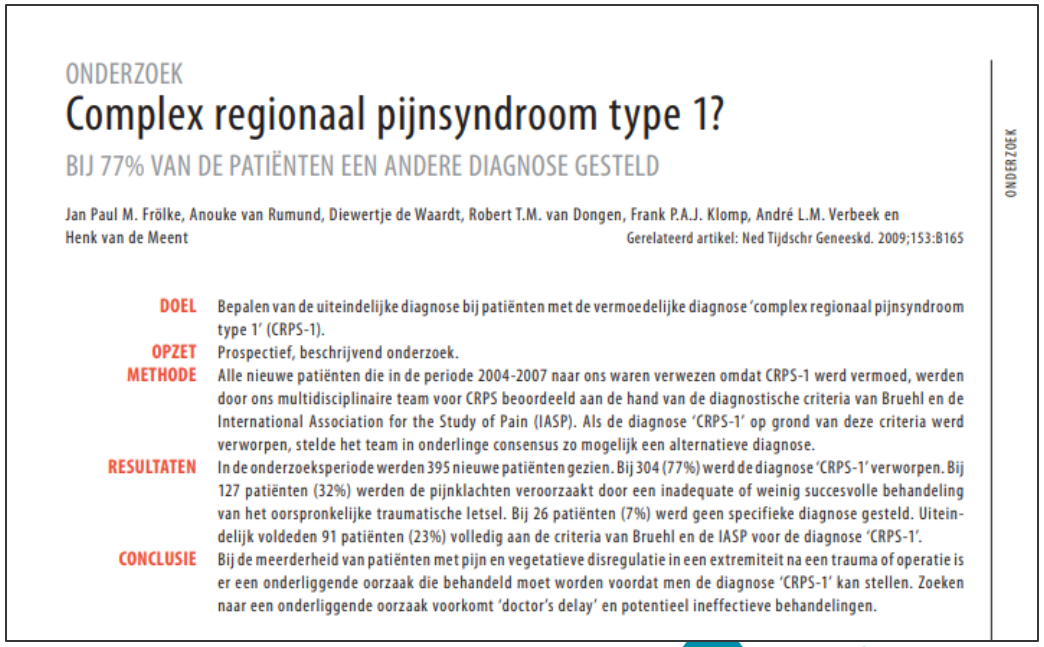
REHABILITATION SECTION

Original Research Article

Characteristics of Complex Regional Pain Syndrome in Patients Referred to a Tertiary Pain Clinic by Community Physicians, Assessed by the Budapest Clinical Diagnostic Criteria

Angela Mailis-Gagnon, MD, FRCPC (PhysMed), MSc,*†‡ Shehnaz Fatima Lakha, MSc,*§

patients were statistically significantly more likely to 1) have suffered a fracture; 2) report symptoms in



ONDERZOEK

Complex regionaal pijnsyndroom type 1?

BIJ 77% VAN DE PATIËNTEN EEN ANDERE DIAGNOSE GESTELD

Jan Paul M. Frölke, Anouke van Rumund, Diewertje de Waardt, Robert T.M. van Dongen, Frank P.A.J. Klomp, André L.M. Verbeek en Henk van de Meent

Gerelateerd artikel: Ned Tijdschr Geneeskd. 2009;153:B165

DOEL Bepalen van de uiteindelijke diagnose bij patiënten met de vermoedelijke diagnose 'complex regionaal pijnsyndroom type 1' (CRPS-1).

OPZET Prospectief, beschrijvend onderzoek.

METHODE Alle nieuwe patiënten die in de periode 2004-2007 naar ons waren verwezen omdat CRPS-1 werd vermoed, werden door ons multidisciplinaire team voor CRPS beoordeeld aan de hand van de diagnostische criteria van Bruehl en de International Association for the Study of Pain (IASP). Als de diagnose 'CRPS-1' op grond van deze criteria werd verworpen, stelde het team in onderlinge consensus zo mogelijk een alternatieve diagnose.

RESULTATEN In de onderzoeksperiode werden 395 nieuwe patiënten gezien. Bij 304 (77%) werd de diagnose 'CRPS-1' verworpen. Bij 127 patiënten (32%) werden de pijnklachten veroorzaakt door een inadequate of weinig succesvolle behandeling van het oorspronkelijke traumatische letsel. Bij 26 patiënten (7%) werd geen specifieke diagnose gesteld. Uiteindelijk voldeden 91 patiënten (23%) volledig aan de criteria van Bruehl en de IASP voor de diagnose 'CRPS-1'.

CONCLUSIE Bij de meerderheid van patiënten met pijn en vegetatieve disregulatie in een extremiteit na een trauma of operatie is er een onderliggende oorzaak die behandeld moet worden voordat men de diagnose 'CRPS-1' kan stellen. Zoeken naar een onderliggende oorzaak voorkomt 'doctor's delay' en potentieel ineffectieve behandelingen.

ONDERZOEK

Goebel 2019

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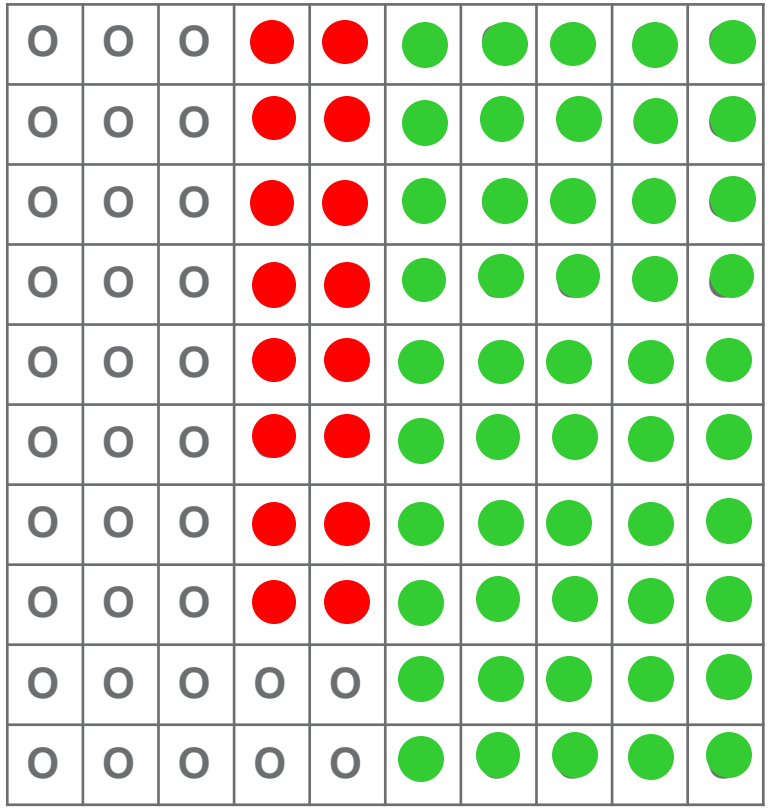
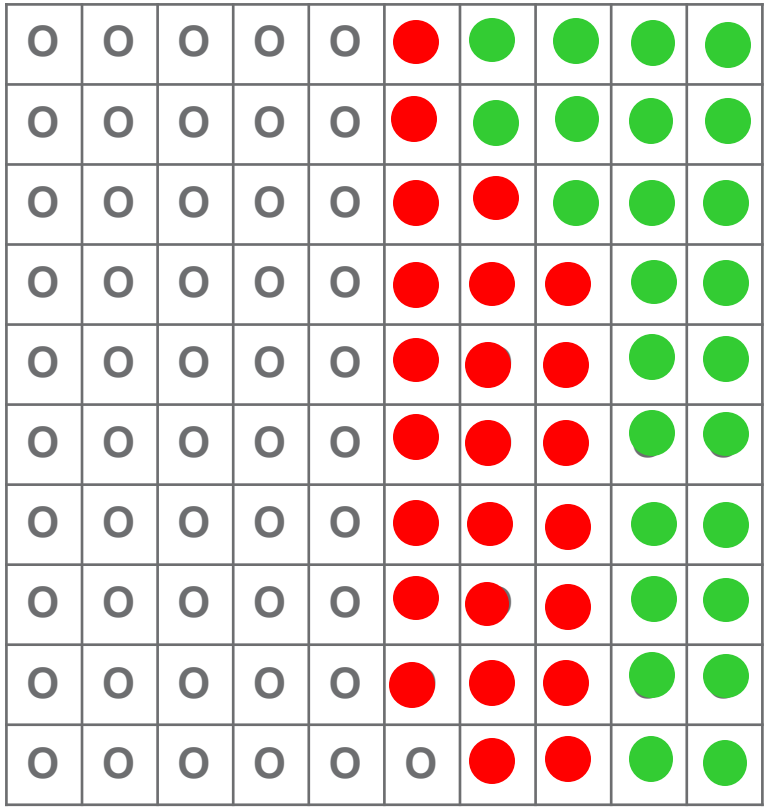
POOR: Prevalence is a Devil !

PPV: se x prev / (se x prev) + {(1-sp) x (1-prev)} ; NPV: sp x (1-prev) / {sp x (1-prev)} + {(1-sens) x prev}

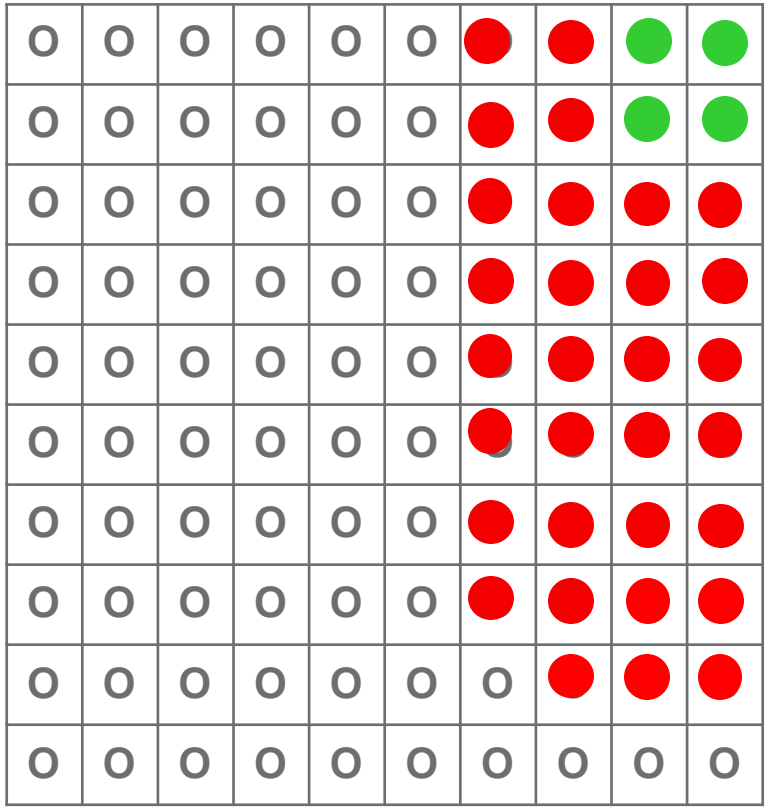
Green: true positive
Red: false positive



Prevalence according to IASP (50%)



Prevalence Centre Reference: 25%



Prevalence after wrist fracture: 3-5%

Criterion 4 (no other diagnosis can better explain…): the only way to escape the devil!

When in doubt: remain cautious and follow your patient!…

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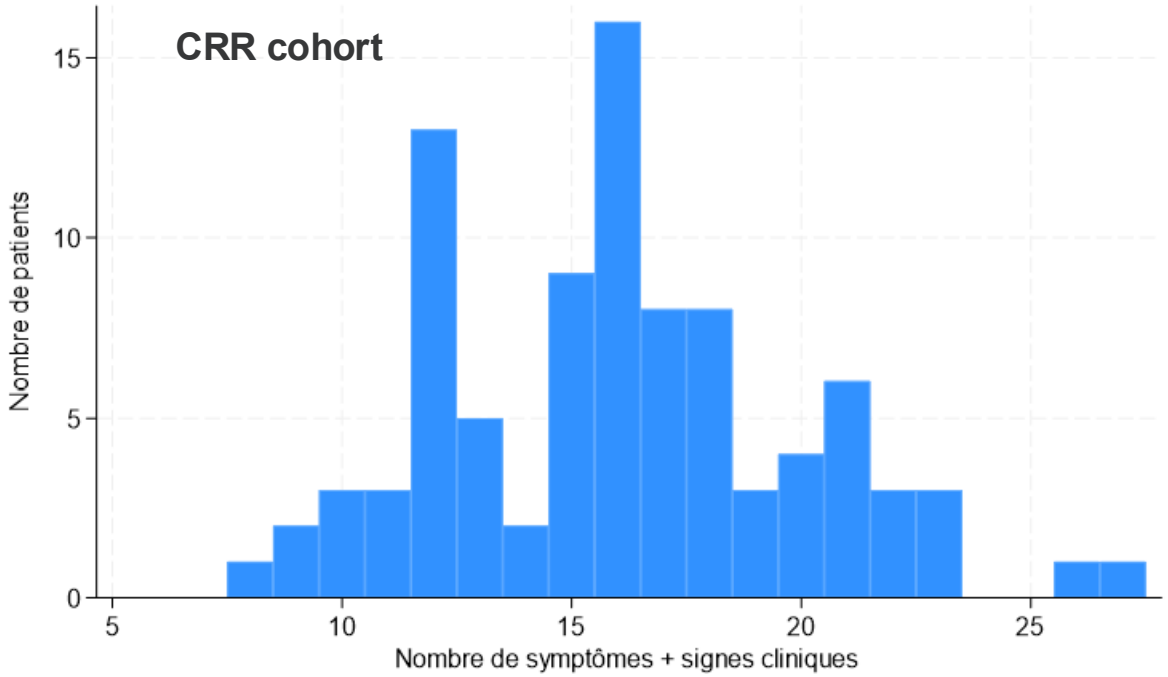
POOR: Clinical heterogeneity is another Devil!



- **Group 1:** a relatively limited syndrome (11.6±1.5)
- **Group 2:** a florid syndrome (18.1±1.5)

➢ Significant T0 (G1<G2): DN4 < 0.001 / BPI = 0.07 / Disability < 0.01

➢ Outcomes (1y): slightly better (G1) but NS

Research Paper

PAIN

Complex regional pain syndrome: evidence for warm and cold subtypes in a large prospective clinical sample

Stephen Bruehl[a,*], Christian Maihöfner[b], Michael Stanton-Hicks[c], Roberto S.G.M. Perez[d], Jean-Jacques Vatine[e], Florian Brunner[f], Frank Birklein[g], Tanja Schlereth[g], Sean Mackey[h], Angela Mailis-Gagnon[i], Anatoly Livshitz[e], R. Norman Harden[j]

ARTICLE

Clinical phenotypes and classification algorithm for complex regional pain syndrome

Violeta Dimova, PhD,* Myriam Selma Herrnberger, MD,* Fabiola Escolano-Lozano, MD, Heike Lydia Rittner, MD, Eva Vlckova, MD, Claudia Sommer, MD, Christian Maihöfner, MD Frank Birklein, MD

Correspondence
Dr. Dimova
violeta.dimova@unimedizin-mainz.de

Neurology® 2020;94:e357-e367. doi:10.1212/WNL.0000000000008736

no agreement!

General Section Review

OPEN

PAIN REPORTS

Subtypes of complex regional pain syndrome—a systematic review of the literature

Lone Knudsen[a], Lana Santoro[b], Stephen Bruehl[c], Norman Harden[d], Florian Brunner[e,*]

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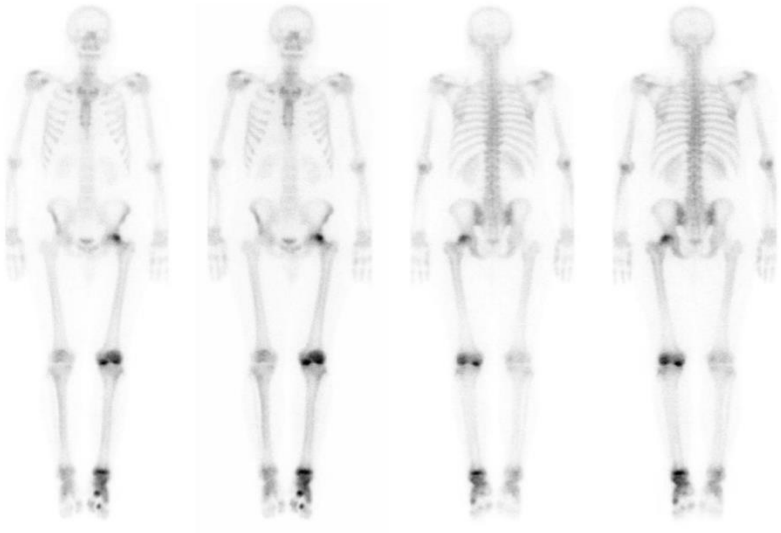
And finally… Imaging and CRPS: truly diabolical?

Scintigraphy and CRPS: sensitivity 0.55 - specificity 0.94 (the opposite of Budapest) – Wertli 2017

- **As a first-line diagnostic tool (before Budapest): <u>NOT RECOMMENDED/FORBIDDEN</u>!**
- **As a second-line test after Budapest (post-test)**: may improve specificity if:
  - Early (less than 6 months)
  - Classic peripheral/"warm" subtype

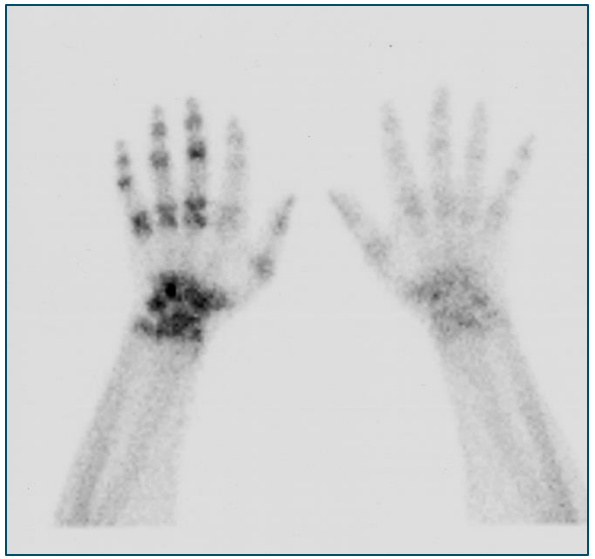
Scintigraphy also highlights **multifocal and partial/metameric** forms

On the other hand, MRI: only for DD *(se 0.06-0.91 / sp 0.50-1.00 - Henzi A, online 7 November 2025)* **!**



Benchouk 2021

Konzelmann 2014



Conclusions

- CRPS deserves better than an approximate diagnosis (Budapest rigorously used!)
- But the Budapest criteria are not perfect (moderate sp)
- **DDs remain more common than CRPS!**
- **Additional testings (imaging/laboratory, etc.) are the only way to improve specificity (Doury's revenge!)**
- **Imaging allows deep forms/multifocal (bone) to be identified (Sudeck's revenge!)**
- **The standards for diagnosing CRPS should be adapted (flags, criteria 4)**

- The diagnosis of CRPS remains a work in progress (biomarkers…?)
- The story continues...!

Thank you !

Questions ?

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In the absence of recognised subtypes... the severity score (CSS)

Research Paper

PAIN

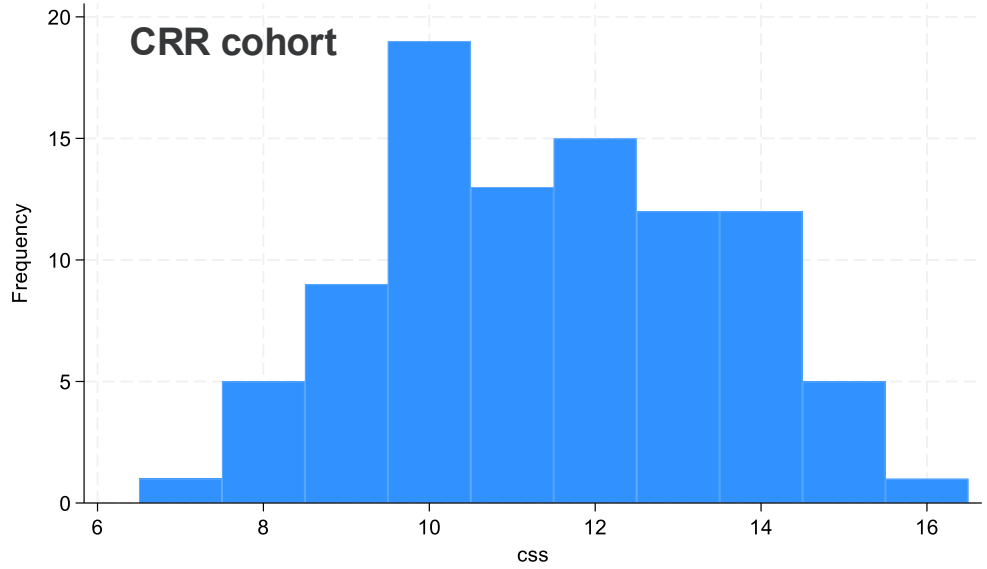
A prospective, multisite, international validation of the Complex Regional Pain Syndrome Severity Score

R. Norman Harden[a,*], Christian Maihofner[b], Elias Abousaad[a], Jean-Jacques Vatine[c], Amy Kirsling[a], Roberto S.G.M. Perez[d], Maxine Kuroda[a], Florian Brunner[e], Michael Stanton-Hicks[f], Johan Marinus[g], Jacobus J. van Hilten[g], Sean Mackey[h], Frank Birklein[i], Tanja Schlereth[i], Angela Mailis-Gagnon[j], Joe Graciosa[a], Sara B. Connoly[a], David Dayanim[a], Michael Massey[a], Hadas Frank[c], Anatoly Livshitz[c], Stephen Bruehl[k]

Table 2

CRPS severity score CSS.

Self-reported symptoms
Continuing disproportionate pain
Allodynia or hyperalgesia
Temperature asymmetry
Skin color asymmetry
Sweating asymmetry
Asymmetric edema
Trophic changes
Motor changes
Signs observed on examination
Hyperalgesia to pinprick
Allodynia
Temperature asymmetry
Skin color asymmetry
Sweating asymmetry
Asymmetric edema
Trophic changes
Motor changes



- **8 + 8: 0–16 points**
- **MCDC: 4.9**

(be careful, first version (2010): 17 points)

	Harden 2017	Louis 2025	CRR 2025
CSS at inclusion (<6 months)	11.4 ± 2.4	11.5 ± 2.2	11.5 ± 2.0

Correlated with (CRR): Pain (severity and interference), DN4, Disability, HAD… small to moderate correlations *(0.22-0.54) (// Harden 2017)*

Harden 2010, **2017**

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