

# Charcot neuro-osteoarthropathy

International Working Group of the Diabetic Foot (IWGDF) 2023 Guidelines  
&  
Lived Experience

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## Practical Guidelines

Practical guidelines (2023 update)

[Read more](#)



## Prevention

Prevention guideline (2023 update)

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## Classification

Classification guideline (2023 update)

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## Infection

IWGDF/IDSA Infection guideline (2023 update)

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## PAD

Intersocietal PAD guideline (2023 update)

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## Offloading

Offloading guideline (2023 update)

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## Wound Healing

Wound healing interventions guideline (2023 update)

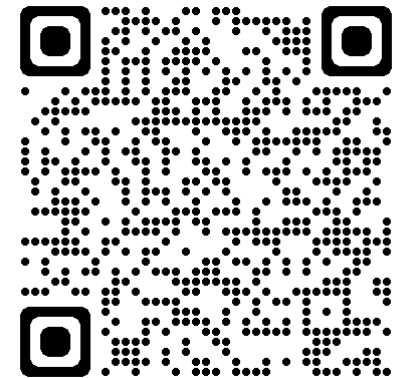
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## Charcot

Charcot's neuro-osteoarthropathy (2023 update)

[Read more](#)



[Guidelines \(2023 update\) - IWGDF Guidelines](#)



Charcot

# Incidence and prevalence

- Neuropathy related to DM probably affects 25–35% of people
- Prevalence 0.1%- 5% of people with DM and CNO have been reported
- True incidence and prevalence of CNO is still largely unknown
- More recent studies report an increase in the numbers of people with CNO, but this could be a result of increased awareness, rather than an actual increase

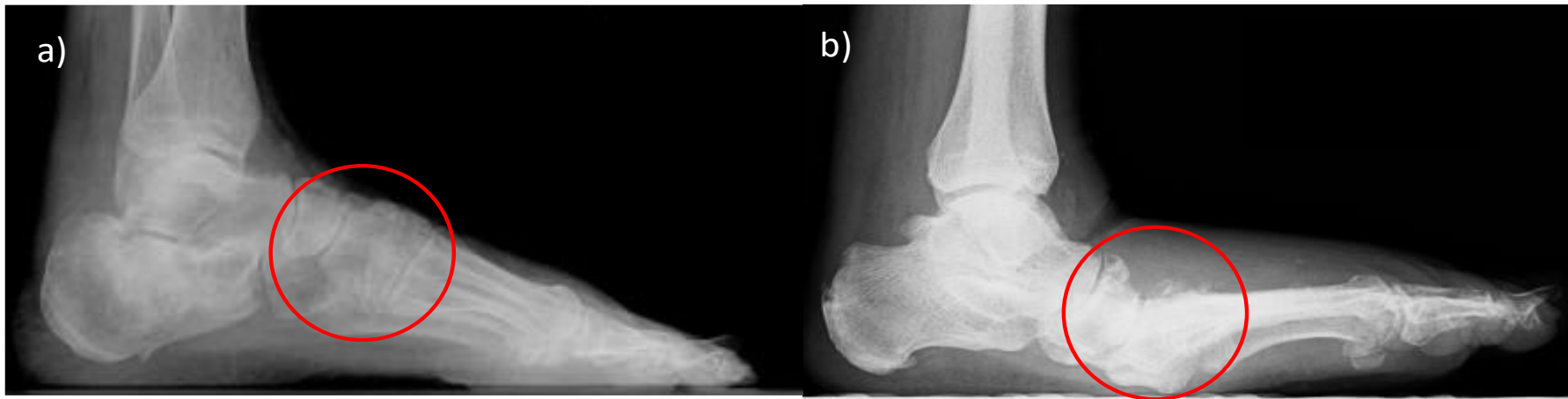




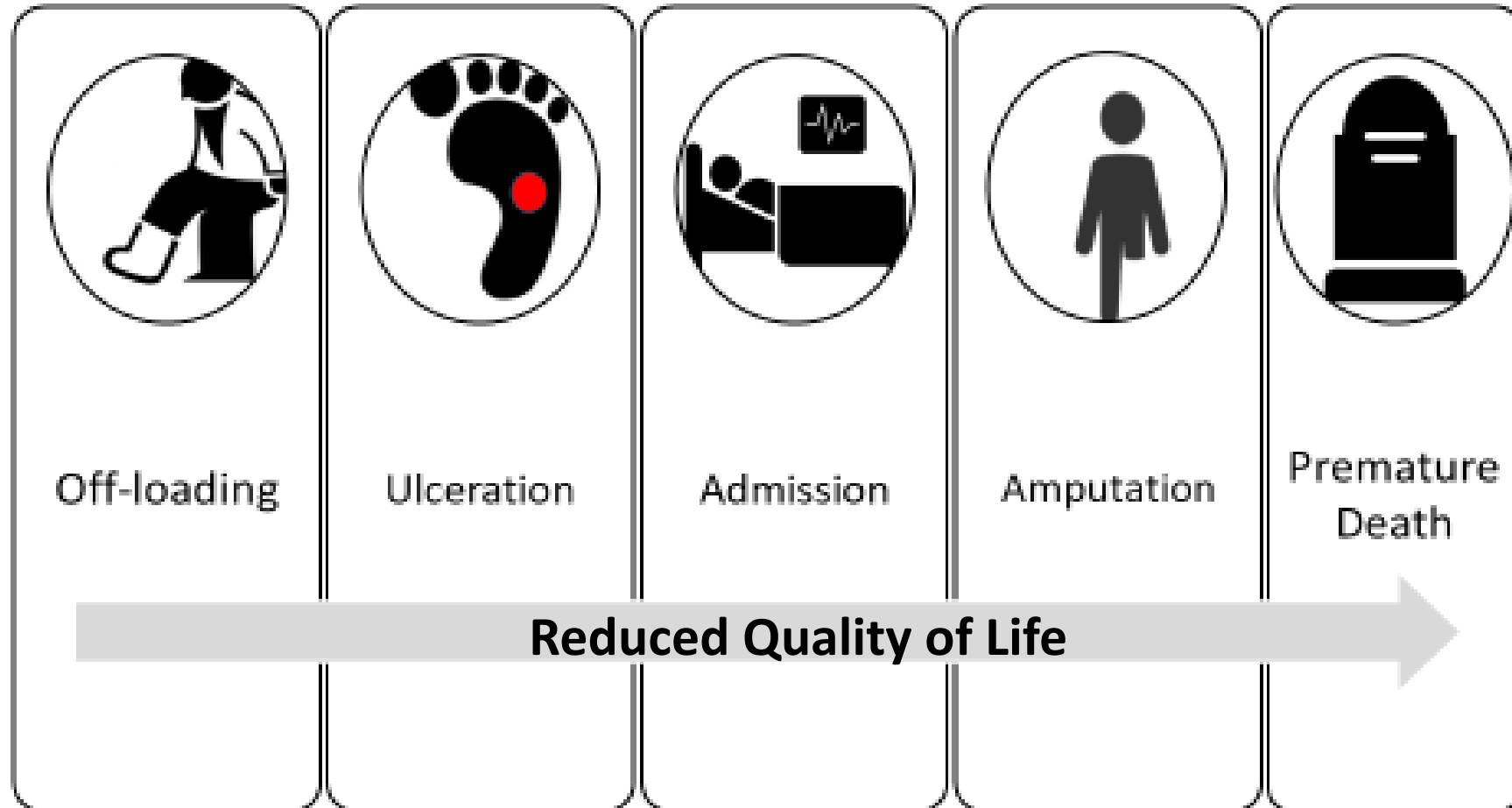
Charcot

# Definitions - Charcot

CNO is an inflammatory process in persons with diabetes mellitus and neuropathy which results in injury to bones, joints, and soft tissues.



# Background





Prof. Dr. D Wukich



Dr. K Raspovic



Prof. N Schaper



Prof. Dr. E Senneville



Dr. C Gooday



Dr. N Petrova



Prof. Dr. M Hastings



Dr. A Bal



A/Prof. C Holmes



Dr. R Bem



Dr. M Santini Araujo



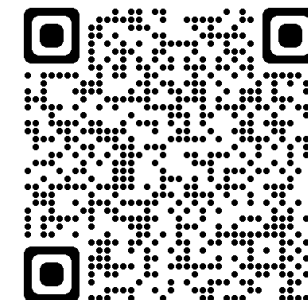
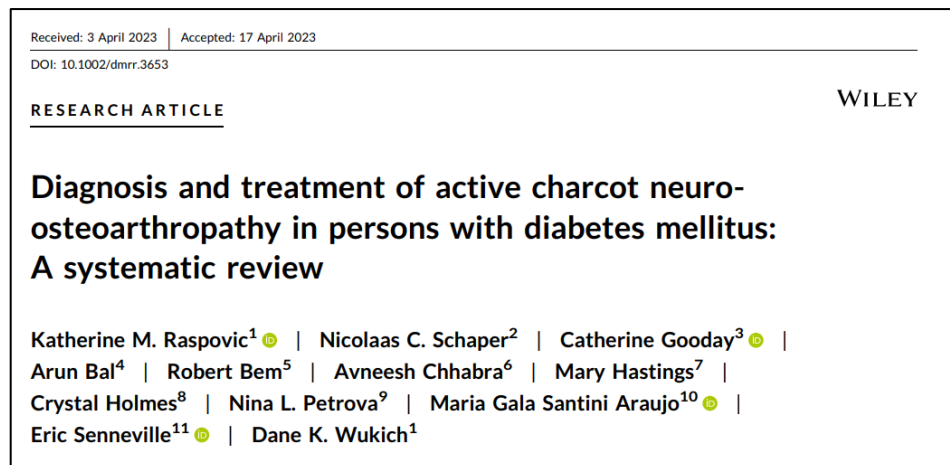
Dr. A Chhabra



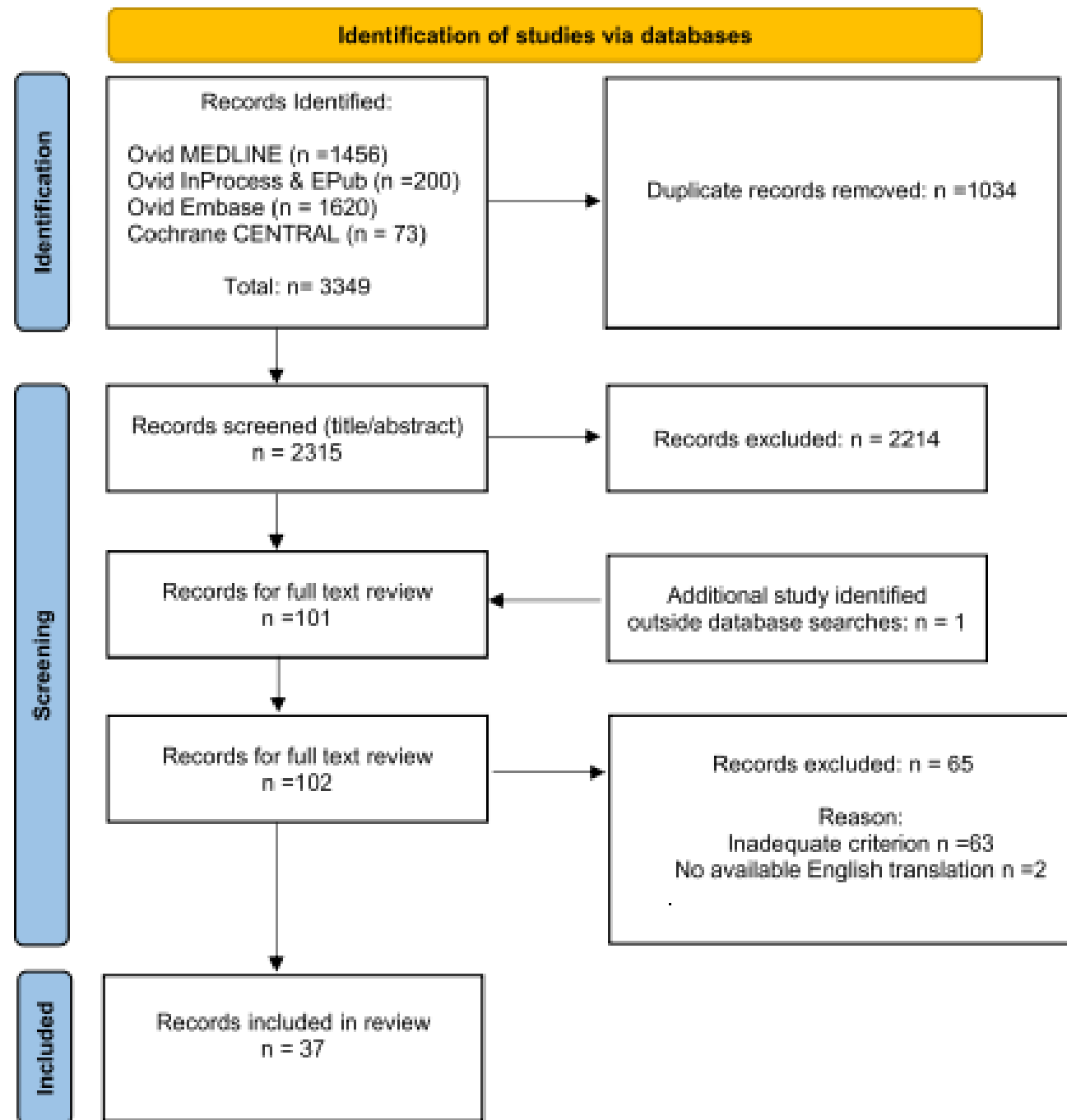
Charcot

# Systematic Review - Aim

- To investigate the evidence for the diagnosis and subsequent treatment of active CNO in persons with diabetes mellitus and intact skin.
- To clarify the objective methods for determining remission.
- To evaluate the evidence for the prevention of re-activation of CNO patients who are no longer in the active phase.



# PRISMA Flow Diagram





# Methods

PACO: In a person with diabetes mellitus and intact skin in whom active CNO is considered, what is the accuracy of clinical findings using imaging as a comparator to predict active CNO?



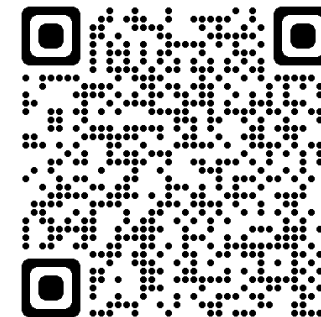
Evidence Statement: We identified no evidence on the diagnostic accuracy of temperature difference between feet in patients with suspected active Charcot neuro-osteoarthropathy



Charcot

# Guidelines

- The rationale based on the evidence from the systematic review
- The strength of each recommendation was graded as ‘strong’ or ‘conditional’.
- ‘Best Practice Statements’ were developed when the certainty of the desirable effects of an intervention clearly outweighed its undesirable effects in the situations where the available evidence was not available



# Judgements

- Importance of problem
- Desirable effects
- Undesirable effects
- Certainty of evidence
- Values (uncertainty and variability)
- Balance of effects
- Resources required – certainty
- Cost effectiveness
- Equity
- Acceptability
- Feasibility

Strong recommendation against the intervention ○	Conditional recommendation against the intervention ○	Conditional recommendation for either the intervention or the comparison ○	Conditional recommendation for the intervention ○	Strong recommendation for the intervention ●
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# Definitions – Active Charcot

Presence of a red, warm, swollen foot with osseous abnormalities on imaging in a person with diabetes mellitus and neuropathy. During the course of the disease, as long as there are signs of inflammation in the affected foot, the CNO is presumed to be “active.”



Charcot

# Diagnosis CNO

- Always consider active CNO in a person with diabetes mellitus, neuropathy and intact skin when there are clinical findings of an increase in temperature, oedema, and/or redness of the foot, compared to the contralateral foot. (*Best Practice Statement*)
- Initiate knee-high immobilisation/offloading promptly while further diagnostic studies are performed to confirm or rule out active CNO, when active CNO is suspected in a person with diabetes mellitus and intact skin. (*Strong; Low*)



If you use infra-red thermometry, do you follow a set protocol?

- 1. Yes
- 2. No
- 3. Do not use



# Infrared Thermometry



Consider using infrared thermometry to measure skin temperature of the feet in a person with diabetes mellitus and suspected CNO with intact skin, using a standardised approach to the measurement of temperatures to allow for more accurate comparison over time. *(Conditional; Low)*





Charcot

- Consider calculating temperature difference between both legs, using the highest temperature on the affected foot or ankle in comparison with the same anatomic point on the contralateral extremity. (Conditional; Low)
- In a person with diabetes mellitus with bilateral active CNO and intact skin or with unilateral CNO and intact skin in the absence of the contralateral limb, ascending temperature gradients (toe-knee) may be useful for comparison over time. (Best Practice Statement)

# How long do you wait for the foot to acclimatise before you take the temperature?



- 1. Take the temperatures straight away
- 2. 5-10 minutes
- 3. 11-20 minutes
- 4. 21-29 minutes
- 5. Greater than 30mins
- 6. Do not use

# How many different sites on the foot do you test?

- 1. One
- 2. Two-three
- 3. Four-five
- 4. Six-seven
- 5. Greater than seven
- 6. Do not use



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# However, uncertainties exist around:

- Which anatomical locations, these measurements should be performed
- Accuracy of existing thermometers
- If contactor non-contact thermometry devices should be preferred
- Limited information on normative values of skin temperature in the neuropathic foot
- Whether current thermometry devices are valid for these temperature ranges
- Influence of ambient temperature
- Acclimatization time that is needed after the footwear and socks are removed
- Presence of concomitant ulceration, infection or bilateral CNO limits usefulness

# What kind of imaging tests can you request/arrange/refer for ?

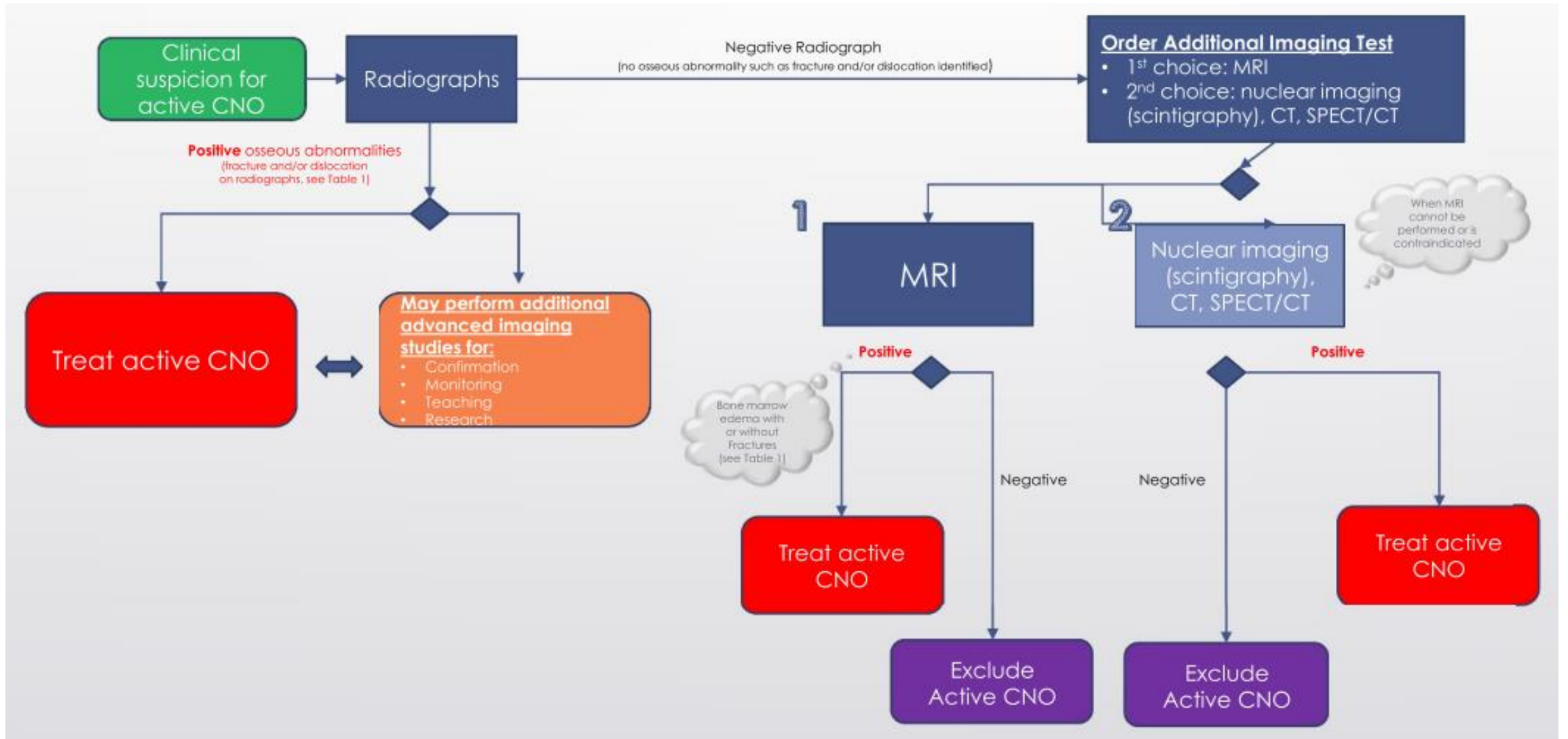
- 1. X-ray
- 2. X-ray and MRI
- 3. X-ray and CT
- 4. All of the above
- 5. Other advanced radiology imaging





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# Diagnosis of CNO - Imaging





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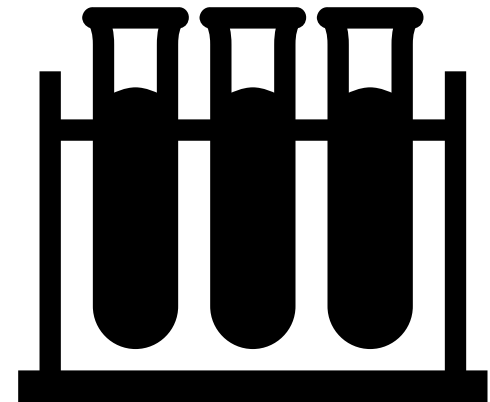
- Perform plain X-ray of the foot and ankle in a person with suspected active CNO
  - Ideally, bilateral plain X-rays should be performed, if possible, for comparison purposes. (Best Practice Statement)
- Views - anteroposterior (AP), medial oblique, and lateral projections (ankle mortices)
  - Ideally, standing (also known as 'weight-bearing')
- If a patient is not able to bear weight on their feet, non-weight-bearing radiographs are an alternative, but may not demonstrate malalignments

# Laboratory Medicine



We suggest not using.....and suspected active CNO with intact skin to diagnose or exclude the disease. (Conditional; Low)

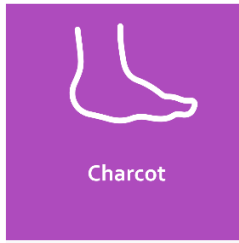
- C-reactive protein (CRP)
- Erythrocyte sedimentation rate (ESR)
- White blood count
- Alkaline phosphatase
- Or other blood tests





# What off-loading do you most commonly provide for people with active Charcot?

- 1. Non-removable cast
- 2. Non-removable knee-high off-loading boot
- 3. Removable knee-high off-loading device
- 4. Ankle-high device
- 5. Other



# Treatment - Offloading

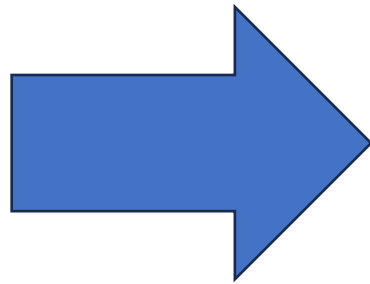
Use a non-removable knee-high device to immobilise and offload the foot to promote the remission of the disease, and prevention or progression of deformity in a person with active CNO and intact skin. *(Strong; Low)*

**Partial weight-bearing** using assistive devices to reduce weight-bearing on the affected limb



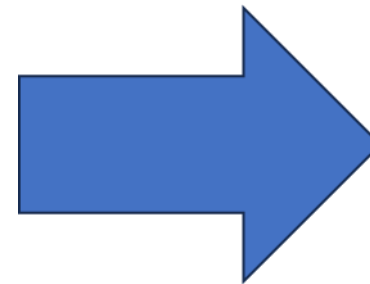
1st Line

Total Contact Cast



2nd Line

Non-removable knee-high device



3rd Line

Removable knee-high device





Charcot

# Treatment - Medical Therapy

- Do not use alendronate, pamidronate, zoledronate, calcitonin, parathyroid hormone, or methylprednisolone as treatment for active CNO in a person with diabetes mellitus and intact skin. *(Strong; Moderate)*
- We suggest not to use denosumab as treatment for active CNO in a person with diabetes mellitus and intact skin. *(Conditional; Low)*
- We suggest evaluating the need for vitamin D and calcium supplementation in a person with diabetes mellitus and active CNO with intact skin during the phase of fracture healing, in persons at risk of vitamin D deficiency and/or those with insufficient calcium intake. *(Conditional, Low)*

# Treatment - Surgery



In a person with active CNO and intact skin, and with instability of foot and ankle joints, and/or deformity with a high-risk of developing ulcer in the offloading device, or pain that cannot be sufficiently stabilized in a Total Contact Cast or a non-removable knee-high device, we suggest that surgical intervention should be considered. (Conditional;Low)



# Definition – Clinical Remission

The absence of clinical signs of inflammation, with or without deformity, and radiographic consolidation of fractures, if present, on plain X-ray. Remission is synonymous with the “inactive” stage of CNO.



Charcot

# Identification of remission

- Consider the measurement of skin temperature of the affected and unaffected limb with serial examinations to monitor disease activity in a person with diabetes mellitus and active CNO with intact skin. (Conditional, Low)
- We suggest not using soft tissue oedema alone to determine when active CNO is in remission. (Conditional; Low)
- We suggest that the findings of temperature measurement, clinical oedema, and imaging should all be considered when concluding that active CNO is in remission. (Conditional; Low)
- Frequency of appointments - fluctuation in oedema volume, co-morbidities, the risks associated with treatment and recovery, access to assistance, and progress. (Conditional; Low)



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# Definition - Re-activation

A repeat “episode”/ return of symptoms in the ipsilateral foot after resolution of the original active CNO event. If active CNO develops in the contralateral foot, that should be considered a “new” CNO event and not re-activation.

# Prevention of re-activation





# Uncertainties and Future Research

- Diagnosis and monitoring
  - Well defined, validated, objective and reproducible criteria
- Off-loading
- Weight-bearing
- Pharmacological treatments
- Surgical intervention
- Risk factors and role of genetic pre-disposition

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RESEARCH ARTICLE

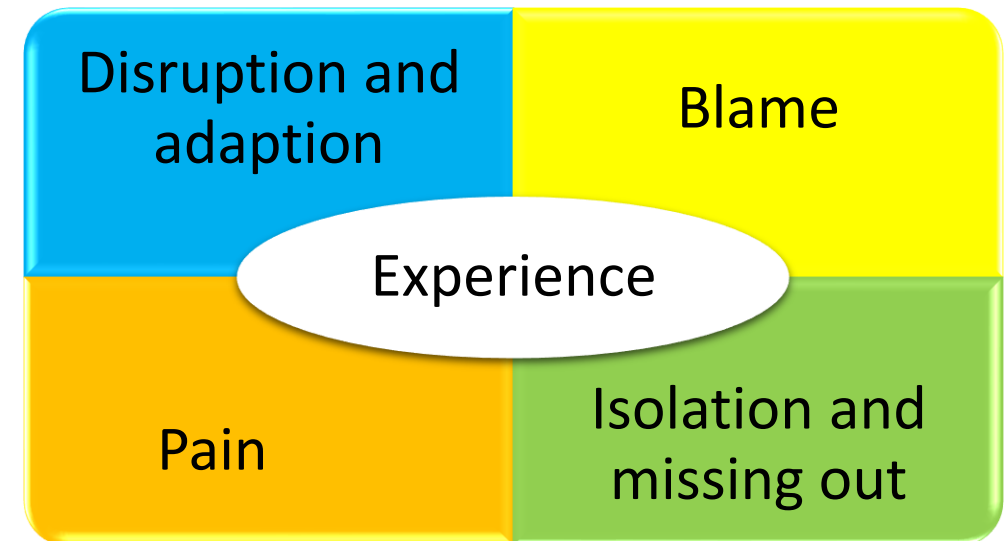
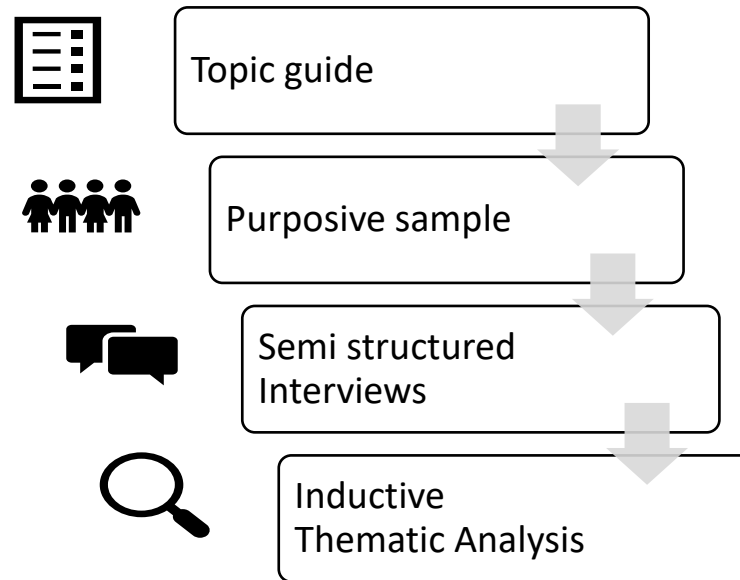


## A qualitative study to understand people's experiences of living with Charcot neuroarthropathy

Catherine Gooday<sup>1</sup> | Wendy Hardeman<sup>2</sup> | Frances Game<sup>3</sup> | Jim Woodburn<sup>4</sup> | Fiona Poland<sup>5</sup>



- 14 participants
- 57% male
- 57% retired prior to their diagnosis of CN
- 86% were married or lived with a partner
- 36% caring responsibilities





# Isolation and missing out



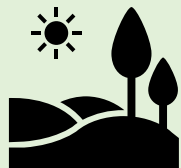
## Working

*"I can't do nothing; can't obviously...can't do stairs or anything. Um, I've had to finish my job because it involved all walking".*



## Volunteering

*"I co-run a youth. We just couldn't do and I absolutely loved, and miss it so much. It was the biggest blow of all".*



## Leisure activities

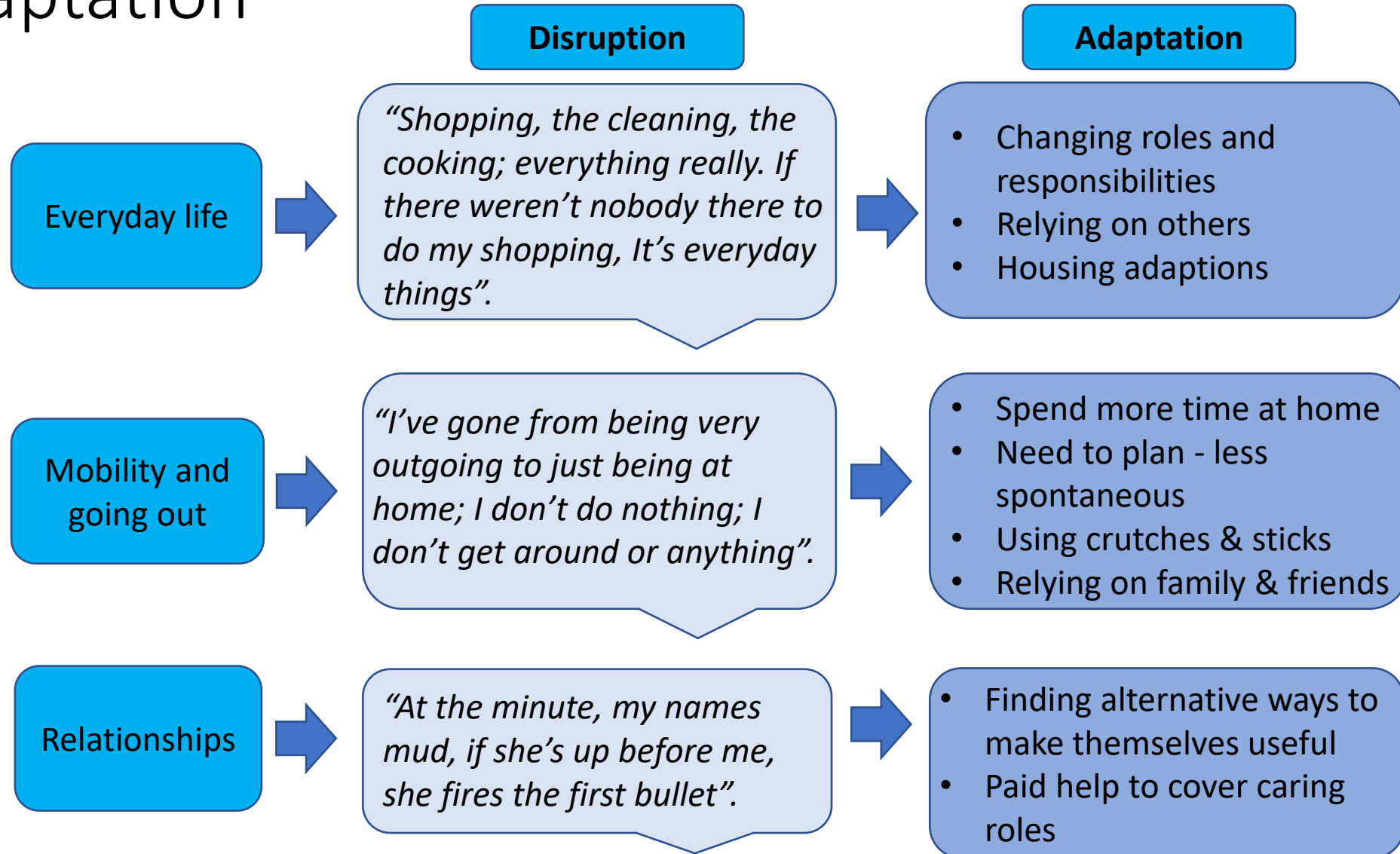
*"Some days, an hour feels like a day. It's just the monotony of being within these four walls. You feel like they're closing in. I've gotta get out of here".*



## Social interaction

*"I miss work. I don't miss the job; I miss the colleagues. So, as I say, it's not so much the place, it's the people isn't it."*

# Disruption and adaptation



# Pain



Charcot



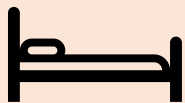
Foot pain

*"So, sometimes I'm feeling a different kind of pain. Like a really sharp pain right up me foot. My toes tingle and that so...It's just so painful"*



Joint pain

*"hips hurt while I'm walking. Knees hurt when I'm walking, when they didn't before"*



Sleeping

*I thrash around in bed all the time and I'm very aware that if I hit the other foot with the boot, I'll wake up"*

# Blame



Charcot



Long term  
health  
choices

*"I wasn't as strict with me insulin and things like that. As I should have been. I know what I've done and yeah; suffering now".*



Short term  
health  
choices

*"I still did a bit of gardening; I was still doing things in the garden which I probably shouldn't have done".*



Delayed  
diagnosis

*"You see I think to myself if I'd gone to the hospital the first time and someone had knew about it, my Charcot wouldn't be as bad".*



Raising  
awareness

*"If people are aware, they have a chance to save their foot".*



# Summary

- The physical and emotional effects of CN on the individual and their family are substantial and sustained.
- They need support from medical, psychological and social care services



# Conclusion



What will you go back to your hospital/clinic and do differently to ensure

- Clinical practice is evidence based
- That services reflect the needs and priorities of people with CNO

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