Pain Trajectories in Survivors of Critical Illness and Post Intensive Care Syndrome

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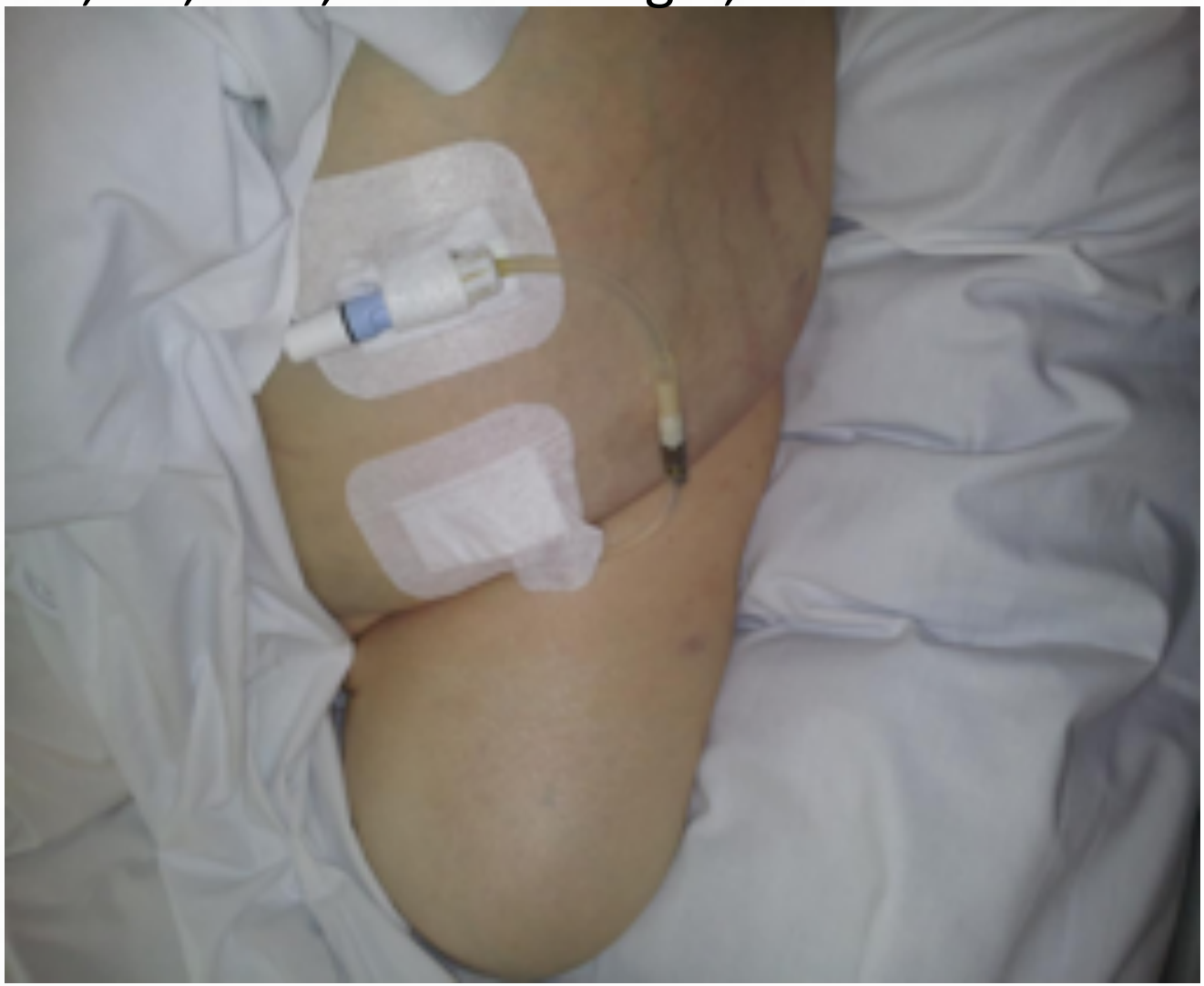
The scope of the problem

- Millions of patients are discharged from ITU annually
- The ITU survivors and their families report wide range of impairments in health lasting months and years after discharge
- Mortality rates alone are no longer sufficient indicator of quality of life
- Functional outcomes and long –term QOL are of increasing consideration

Surviving critical illness many times- 56 years old lady with diabetes, bilateral subsequent amputations, peritoneal dialysis, stroke, MI, PVD, necrotic finger, COPD



Chronic pain in survivors of critical illness- epidemiology

- 44%-73% of all patients 6-12 months post discharge from ICU, *Battle et al, 2013; Griffiths at al,2013*
- ITU patients at risk of developing chronic pain,

  Kyranou et al, 2012
- Chronic pain after surviving sepsis, *Zimmer et al, 2006*
- Poor functional recovery after critical illness: a longitudinal study, *Der Schaaf et al, 2009*

Impact of critical illness on perceived health related quality of life

- During ICU stay
- Hospital stay
- After hospital discharge

Hofhuis et al, 2008

Self-reported physical symptoms in ITU survivors

- 88.5-97% reported sleep disturbance, fatigue and pain within first 4 months after discharge

Trends in depressive symptoms and anxiety in ICU survivors (39 survivors)

- 83.9% -clinically depressed at 2 weeks,
- 64.3% - clinically depressed at 2 months
- 72% after 4 months
- Worse scores for those that could not return home and the ones with moderate to high care needs.
- Anxiety 23-41% persisting for years after discharge
  - *Choi et al. Heart Lung 2016;45 (2):140-146*

Psychological and neurocognitive consequences of critical illness

- Neuropsychological sequelae- intrusive memories, delusions, delirium, panic episodes and nightmares- 23-39% in ITU survivors
- Cognitive dysfunction-40% similar to traumatic brain injury, 26% similar to mild Alzheimer's
- Posttraumatic stress disorder 7-27%
- Depression -33%

Clancy et al, J Intensive Care Soc.2015;16(30):226-233

Risk factors for psychological problems after critical illness

- Length of sedation
- Vasopressors
- Benzodiazepine use
- Disturbed memories during ITU stay
- Psychological history

Risk factors for delirium

- Age
- Medical co-morbidities
- Visual and hearing impairment
- APACHE scores
- Infections
- Iatrogenic
- Drug and alcohol withdrawal
- Anticholinergic drugs

Risk factors for cognitive dysfunction

- Length of anaesthesia
- Hypoxia
- Dysglycaemia
- Sepsis
- Delirium

Pathogenesis of neurocognitive dysfunction

- Neuroinflammation- synaptic and neuronal disruption
- Neurotoxicity
- Neuromodulatory- altered neurotransmitter release

Understanding PTSD after critical care: the early illness amnesia hypothesis

- Multicentre study, 935 included, 599 survived at 6 months., median length of stay 8 days. 18% has PTSS-14 score >49, indicating higher risk of PTSD was associated with not remembering the hospital stay before ITU admission

Granja C et al, Crit Care Med 2008;36(10)2801-9

Pathogenesis

- Neurotoxic effect of sleep deprivation, dysglycaemia, hypoxia
- Immune system and neuroinflammation precipitated by systemic inflammation such as sepsis, ARDS
- Production of cytokines, activation of microglia leading to synaptic and neuronal disruption
- Neuromodulatory- altered neurotransmitter release

Improving long-term outcomes after discharge from UTI: report from stakeholders conference

- Raising awareness and education
- Understanding and addressing barriers to practice
- Identifying research gaps and resources
- Definition: **Post-intensive care syndrome** as term to describe **new or worsening problems in physical, cognitive or mental status arising after critical illness and persisting beyond acute care hospitalisation. The term can be applied to the survivor or family member.**

Crit Care Med.2012;40(2):502-9

Authors: John Hopkins University, Baltimore, USA

Post intensive care syndrome-family

- Psychology re-percussions of critical illness
- Symptoms: anxiety, depression, acute stress disorder, PTSD, complicated grief
- Present in >4 years after discharge in parents of neonatal and paediatric patients
- Treatments :Visits after discharge, support groups, professional referrals for psychology treatments

Preventive measures

- The American College of Critical care Medicine and the Society of Critical care Medicine:Guidance on management of Pain, Agitation and Delirium (PAD)

a/ Regular assessment of pain

b/ Avoid benzodiazepines.

c/Provide light sedation with propofol or dexmedetomidine

d/ Non-pharmacological- progressive mobilisation, sleep hygiene, environment

Behavioral Pain Scale (BPS) 3-12

Item	Description	Score
Facial expression	Relaxed	1
	Partially tightened (eg, brow lowering)	2
	Fully tightened (eg, eyelid closing)	3
	Grimacing	4
Upper limbs	No movement	1
	Partially bent	2
	Fully bent with finger flexion	3
	Permanently retracted	4
Compliance with ventilation	Tolerating movement	1
	Coughing but tolerating ventilation for most of the time	2
	Fighting ventilator	3
	Unable to control ventilation	4

Payen JF, et al. Crit Care Med 2001;29:2258-2263

www.SEDATION-ICMS.org

Awakening and breathing control trial

- ABCDE bundle
- The use of statins reduces delirium
- Early psychological interventions for conscious patients reduced need for medication and PTSD at 12 months follow-up.
- Music therapy- decreases levels of catecholamines, helped reduce anxiety on weaning from mechanical ventilation

  - *Schweikert at al. Lancet 2009;373:1874-1882*

Patient Follow-up and Neuro-rehabilitation

- Patient diaries- as patient have little factual memory of their experiences- record of events kept by nursing staff or family on behalf of the patient to be voluntarily read after recovery- way of gaining sense of reality. Helps construct the illness narrative. Shown to reduce PTSD and improve QOL
- Patient follow-up: Varied practices in the UK. Referral to MDT, usually nurse lead, attendance 30-67%, 3 , 6 , 12 months follow-up- no improvement of QOL, not financially effective. 50% required consultant input, ¾ up took offer to visit ITU-*Prinjha et al. Crit Care 2009;13:R46*
- Patient perspective-often feeling of been abandoned after ITU discharge
- Only 27.3% uptake of NICE guidance, *Connolly et al BMJ 2014open 4(5):e004963*
    - *NICE clinical guideline CG83.Rehabilitation after critical illness, 2009*

Rehabilitation programmes

- Nurse-led Rehabilitation programmes- 3, 6, 12 month follow-up+Self-help physical rehabilitation programme- no cost effectiveness demonstrated
- Consultant input+ referral to psychologist
- Patient visit to ITU- expressing gratitude, finding what happened during their illness
- Patient drop-in forum for patients and relatives to share ITU experiences

Cognitive rehabilitation

- Aim : improving memory and executive function
- A combination of physical and cognitive rehabilitation.
- The RETURN study – improved cognitive function after 12 week rehab programme
- Timing and delivery of such programmes is yet to be defined

- *JacksonJC et al.Crit Care Med 2012;40:1088-1097*

Further options

- Early mobilisation in the intensive care unit: a systematic review. *Adler J, Malone D. Cardiopulm* Phys Ther J.

- Mindfulness- 8 week programme to alter emotion regulated impact on cognition and behaviour
- Meditation for patients and relatives

Johansson B et al, Brian Inj 2012;26:1621-1628

Most common pain syndromes (from my clinical practice)

- Central neuropathic pain post traumatic brain injury, brain tumours, strokes
- Complex myogenic neuropathic pain- iliopsoas syndrome-AAA repair, scalene anterior syndrome- neck cancer treatment
- Phantom pain post amputation
- Visceral pain after abdominal surgery- obstruction, ulcerative colitis, necrotising pancreatitis
- Neuropathic pain after Guillain-Barre syndrome
- Sepsis, ARDS in chronic pain patients with FMS, diabetic neuropathies

Most common co-morbidities

- Cognitive dysfunction
- Poor memory
- Attention deficit
- Mood disorders-aggression, impulsiveness, flat affect
- Psychiatric conditions-depression, anxiety, panics, PTSD
- Sleep disturbance
- Dysmorphophobia

Most common functional disorders

- Poor mobility
- Fatigue
- Severe disability
- Loss of self-esteem
- Loss of functional role in family and society

Yatrogenic causes

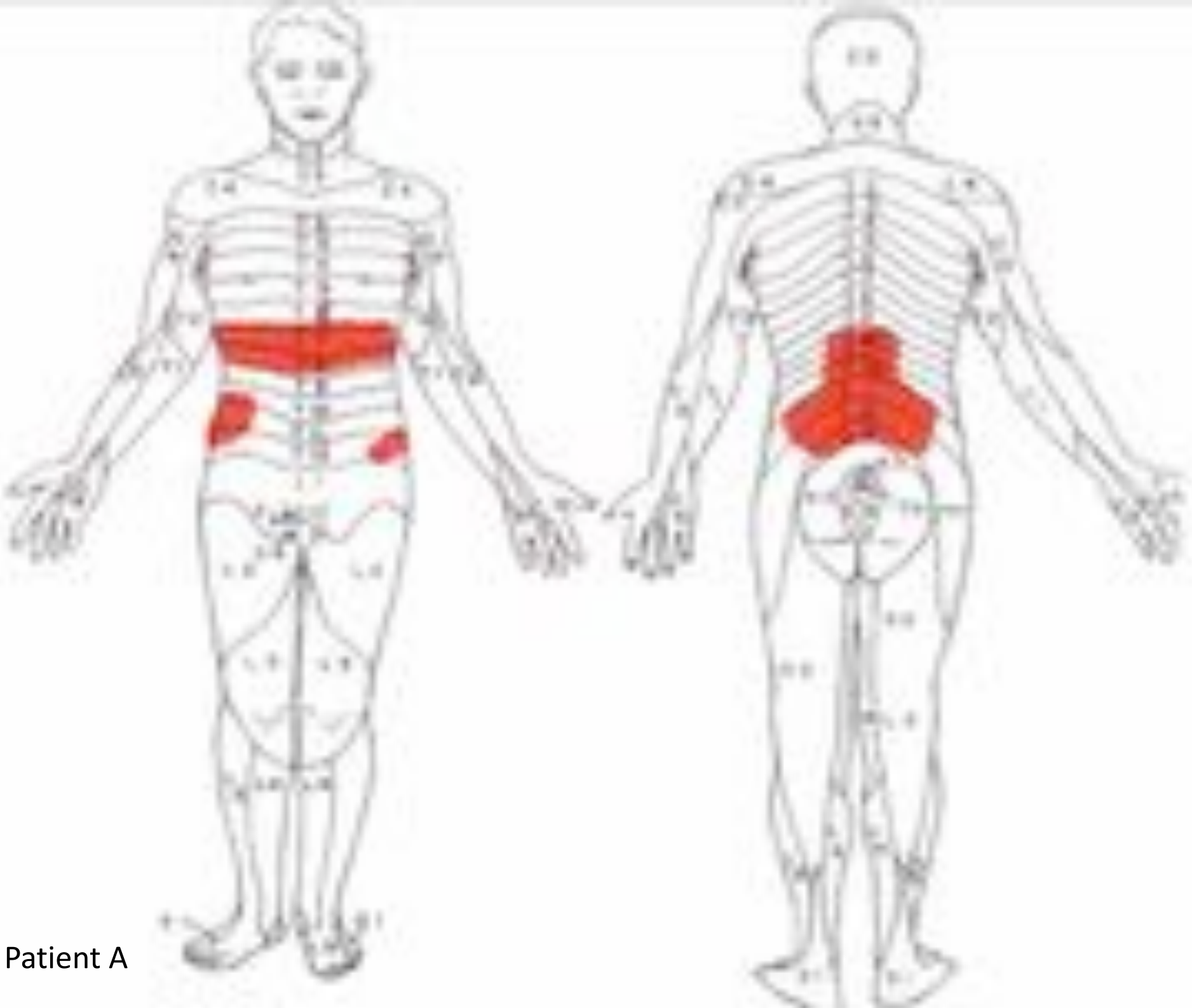
- Medication overuse
- Tolerance and addiction to prescription drugs
- Inadequate education how to self-manage
- Lack of multi professional assessment and staged management of various aspects of the pain syndrome in their dynamics

Case Study -2 patients

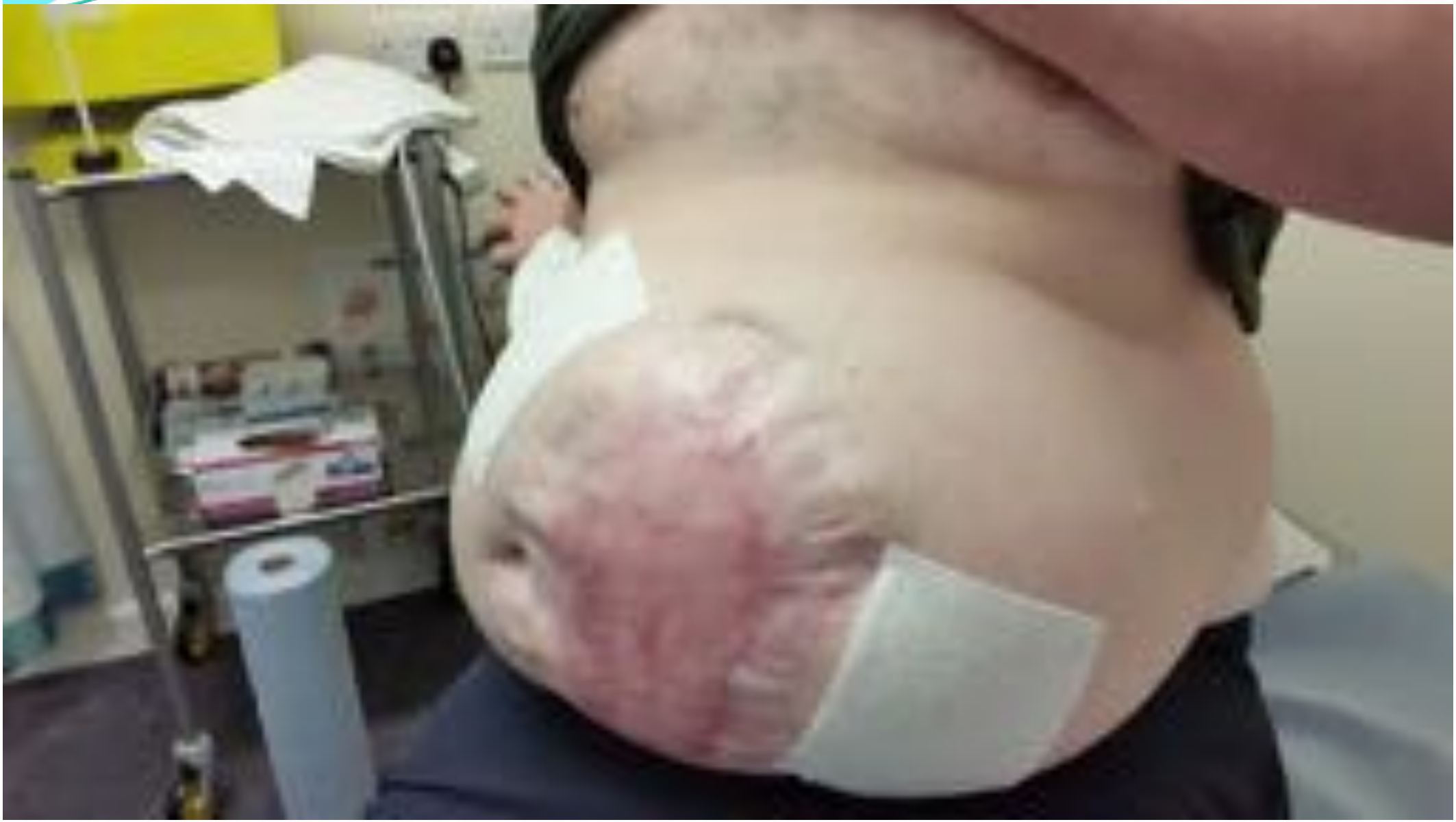
Materials and methods-both patients referred in April 2013

- Male patient A
- Age at referral-34
- Necrotising pancreatitis alcohol induced 2011
- Laparotomy with complications
- ITU stay- months
- Non-healing abdominal wall wound

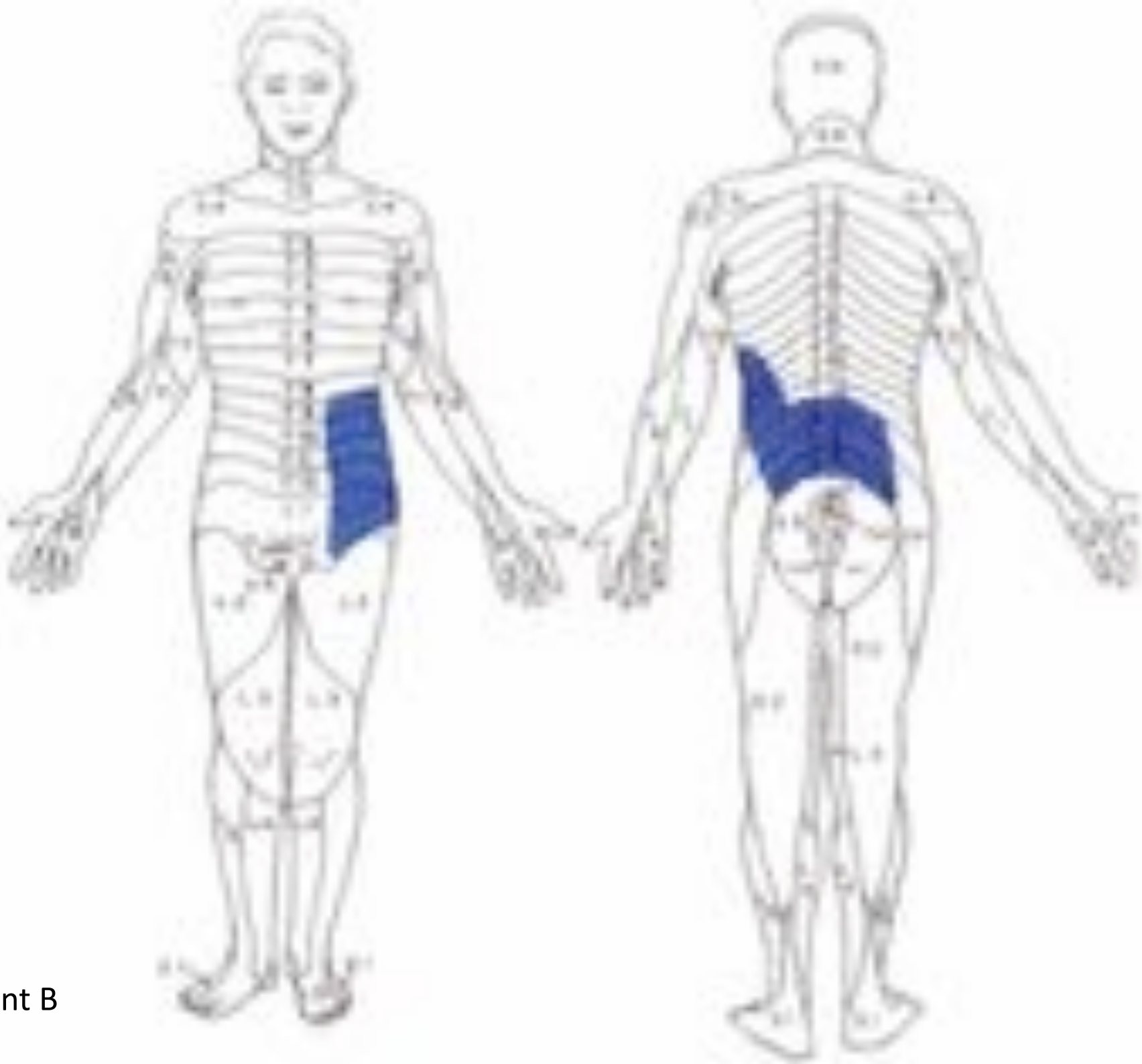
- Male patient B
- Age at referral-36
- Necrotising pancreatitis alcohol induced 2008
- Laparotomy with complications- abscesses, retroperitoneal fibrosis
- ITU stay- months
- Non-healing abdominal wall wound



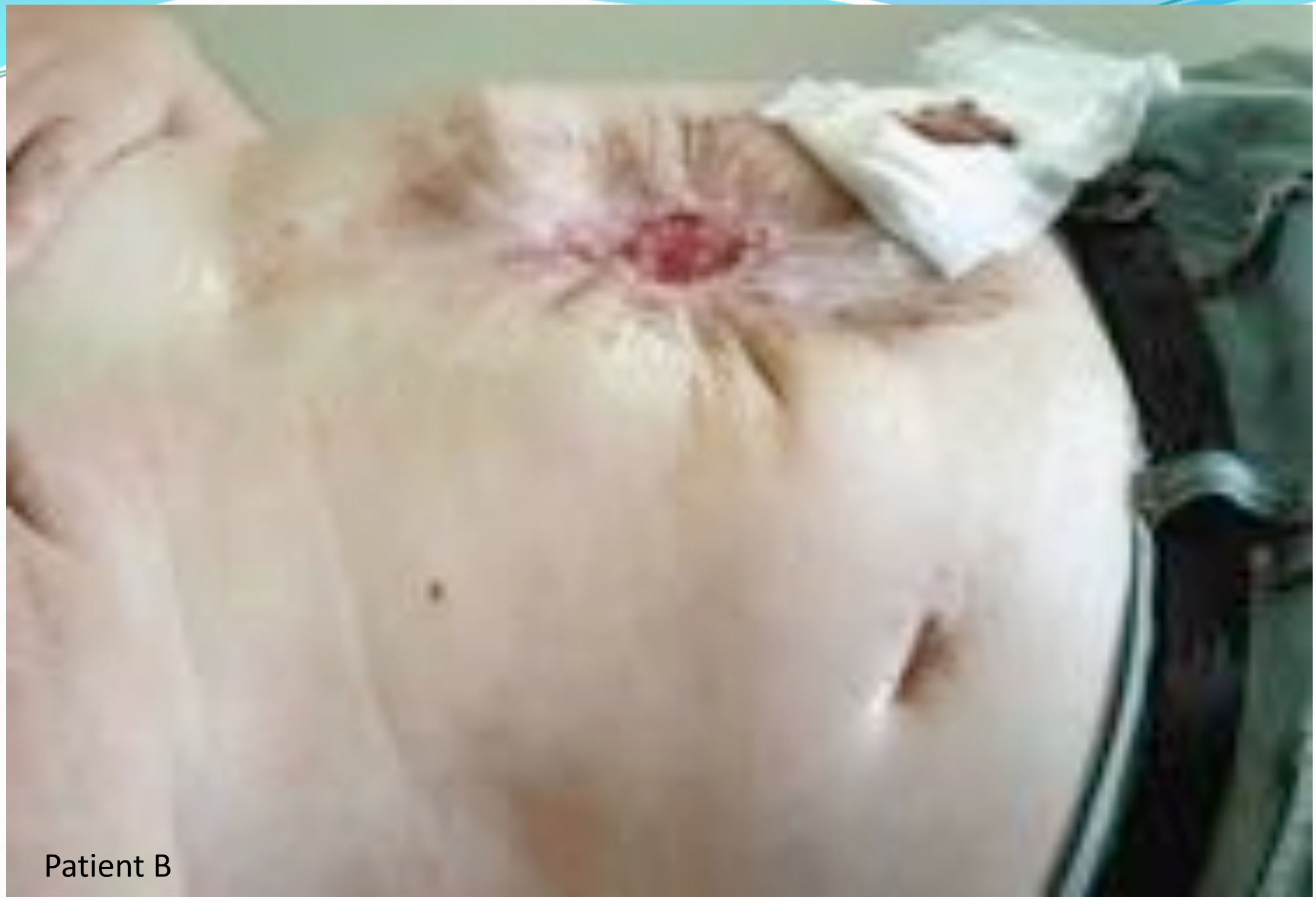
Patient A



Patient A



Patient B


Patient B

Clinical presentation

- Symptoms: Intractable abdominal pain.
- Duration of symptoms-3-5 years
- Opioid consumption:
- 300- 360mg MST
- Quick acting opioid:

Oramorph 300 -840 mls/week (5ml=10 mg morphine), or 600-1,680mg of morphine

Clinical syndromes identified at initial consultation

- Opioid misuse, addiction, hyperalgesia
- Possibility of opioid-induced endocrinopathy
- Severe depressive illness with suicide ideation
- Severe dysmorphophobia
- Invalidity
- Poor posture and locomotion

Pain Trajectories	Patient A	Patient B
Opioid related: Opioid misuse, addiction, hyperlagesia	Yes. MST 150 mg bd Oramorph 600 mg/week	Yes. MST 160 mg bd Oramorph 1800 mg/week
Visceral abdominal pain (cramps, constipation, bloating)	Yes	Yes
Somatic trunk pain	Quadratus lumborum, Rectus abdominis, costo-chondritis	Iliopsoas syndrome,
Musculo-skeletal pain	Sacro-iliac joints, Paravertebral muscles	Lumbar facet joints and sacro-iliac joint pain
Anxiety/depression	Yes, Suicidal HADS 19/17	Yes HADS 17/17
Invalidity	Yes (Wheelchair)	Yes (Crutches)

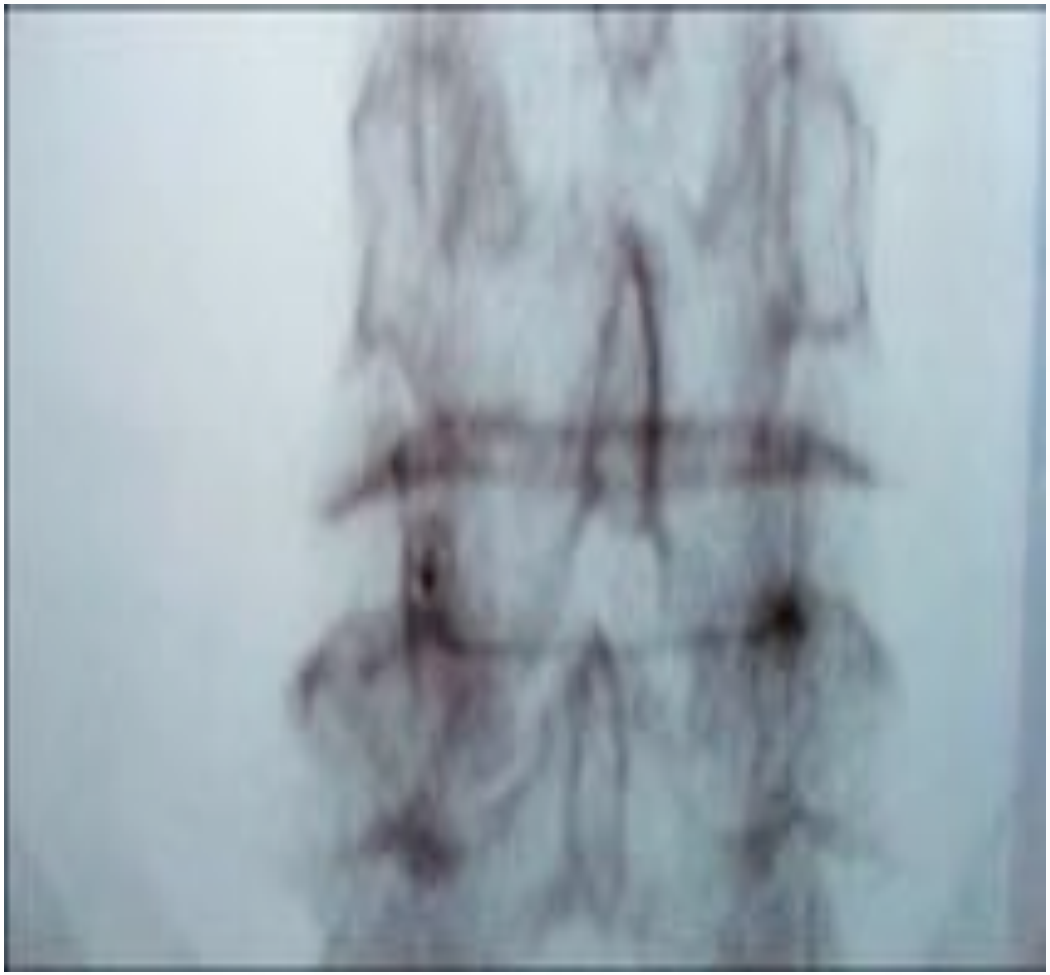
Treatment schedule- opioid rationalisation

- Investigation for endocrinopathy – testostrone, TFT, FSH, Cortisol
- Opioid switch to Targinact: 40/20mg bd
- Opioid reduction of total morphine dose
- Discontinuation of quick release morphine

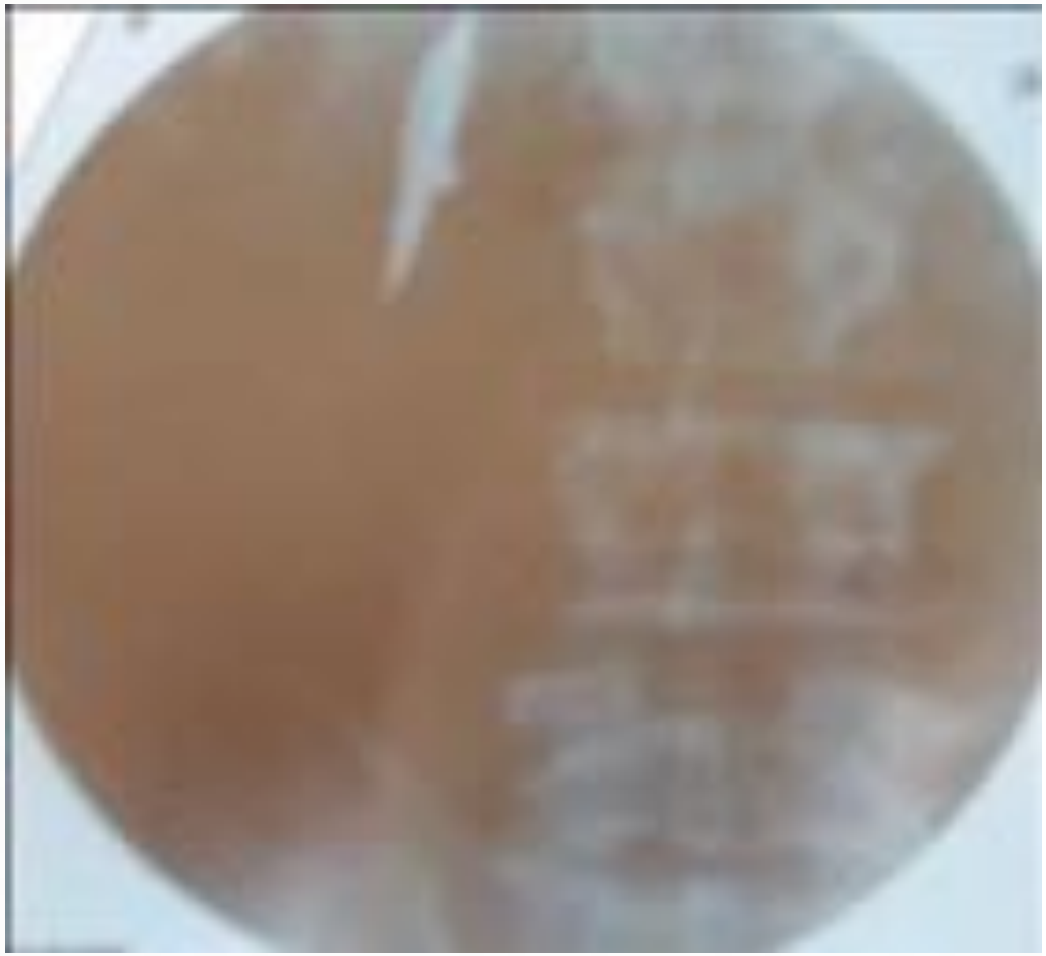
Interventional treatment

- Sacro-iliac joints injections in sitting up position
- Anterior chest wall costo-chondral infiltations
- Quadratus lumborum blocks (sitting up, ultrasound)
- Trigger point injections to rectus abdominis muscles
- Lumbar facet+ sacroiliac joints blocks (X-ray guided, prone position)

Facet Joints injections: Patient A



Iliopsoas muscle block: Patient B



Treatment component	Patient A	Patient B
Number of appointments	17	13
Opioid reduction/switch	Targinact 40/20 mg bd ((Oxycodone/Naloxone)	MST 160 mg bd
Oramorph	stopped	stopped
Clinical Psychology	1 appointment	none
MDT	1	none
Educational seminar	1	none

The team and service provision

- Assessment: Initial and staged by Consultant in Pain medicine
- Clinical nurse specialist- Medication doses and tolerance review
- Clinical psychologist- assessment of cognition, emotions, beliefs
- Patient education seminar- comprehensive and supportive environment with health professionals and patients
- As well: dietician, diabetic nurse

Results of treatment April 2013-December 2017

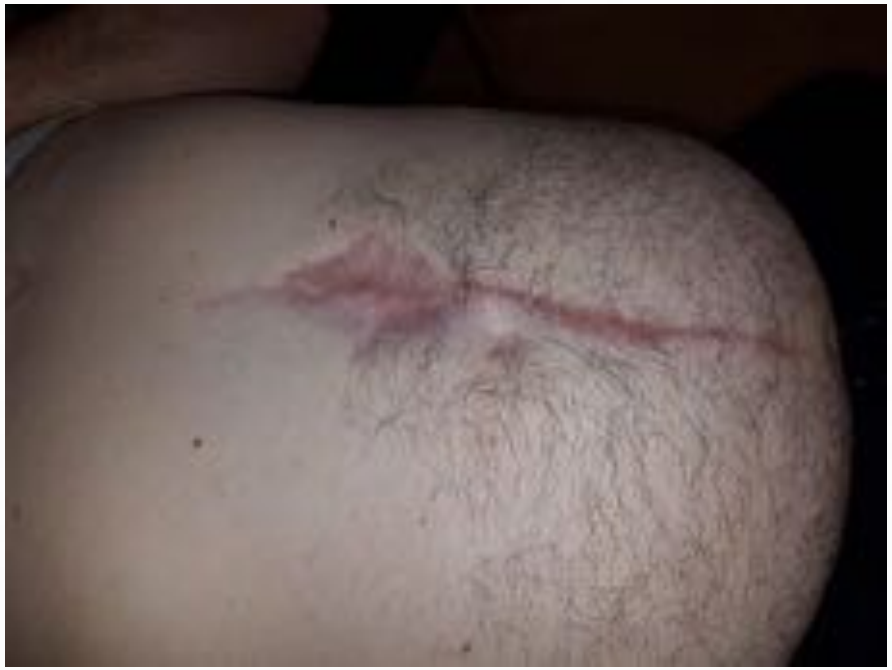
Variables	Patient A	Patient B
VAS (initial 10/10)	Varies, poor pain memory mean 5.5/10	Confusing to quantify, managed well 6-7/10
Patient impression of change	Much improved	Much improved
Abdominal wound	Healed	Healed
Mobility	Walking 2 miles/day	No walking aid needed

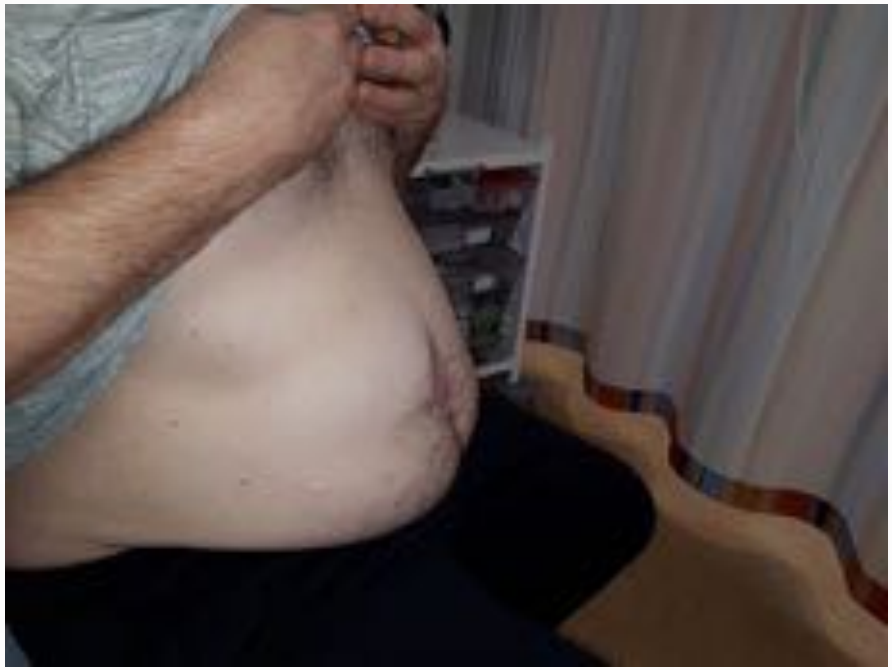
Further developments in 2017

- Interventional treatment with repetition- 3 episodes per annum.
- Patient A lost 30 kg, awaits abdominoplasty in Plastic surgery unit in March 2018 Undergoes support treatment for recurrent back pain.
- Patient B still on 360 mg of MST- not willing to change that. Abdominal wall wound closed. Still followed up

Developments in 2019

Patient A, March 2019- back in work in Building and Maintenance trade. Referred for physio of abdominal muscles. Medication reduction programme. Will be seen in 6 months





Pain trajectories after surviving necrotising pancreatitis

- Our patients surviving critical illness caused by necrotising pancreatitis developed Post-Intensive Care Syndrome with dynamic complex visceral, myofascial, myogenic and neuropathic pain.
- This was complicated by opioid overuse, addiction, personality change, psychiatric morbidity
- They needed comprehensive assessment and individually tailored treatment schedule in the Chronic pain clinic
- They are likely to remain needy of specialist pain services requiring staged multidisciplinary approach long term

Conclusions

- Survivors of critical illness and their families are at risk of developing Post-Intensive Care Syndrome causing long-term physical, cognitive and mental morbidity.
- Pain Trajectories in survivors of critical illness are complex and in dynamic development.
- Individual outcomes of treatment are difficult to predict
- Improving symptoms of patients with Post-Intensive Care Syndrome patients and chronic pain may require prolonged comprehensive multi professional management directed by consultant in pain medicine
- Post ITU discharge engagement of ITU specialist, pain team members, clinical psychologist as MDT working group is likely to be beneficial in early recognition of complex pain syndromes aiming at minimizing their impact on psychological, physical and social wellbeing of the critical illness survivors

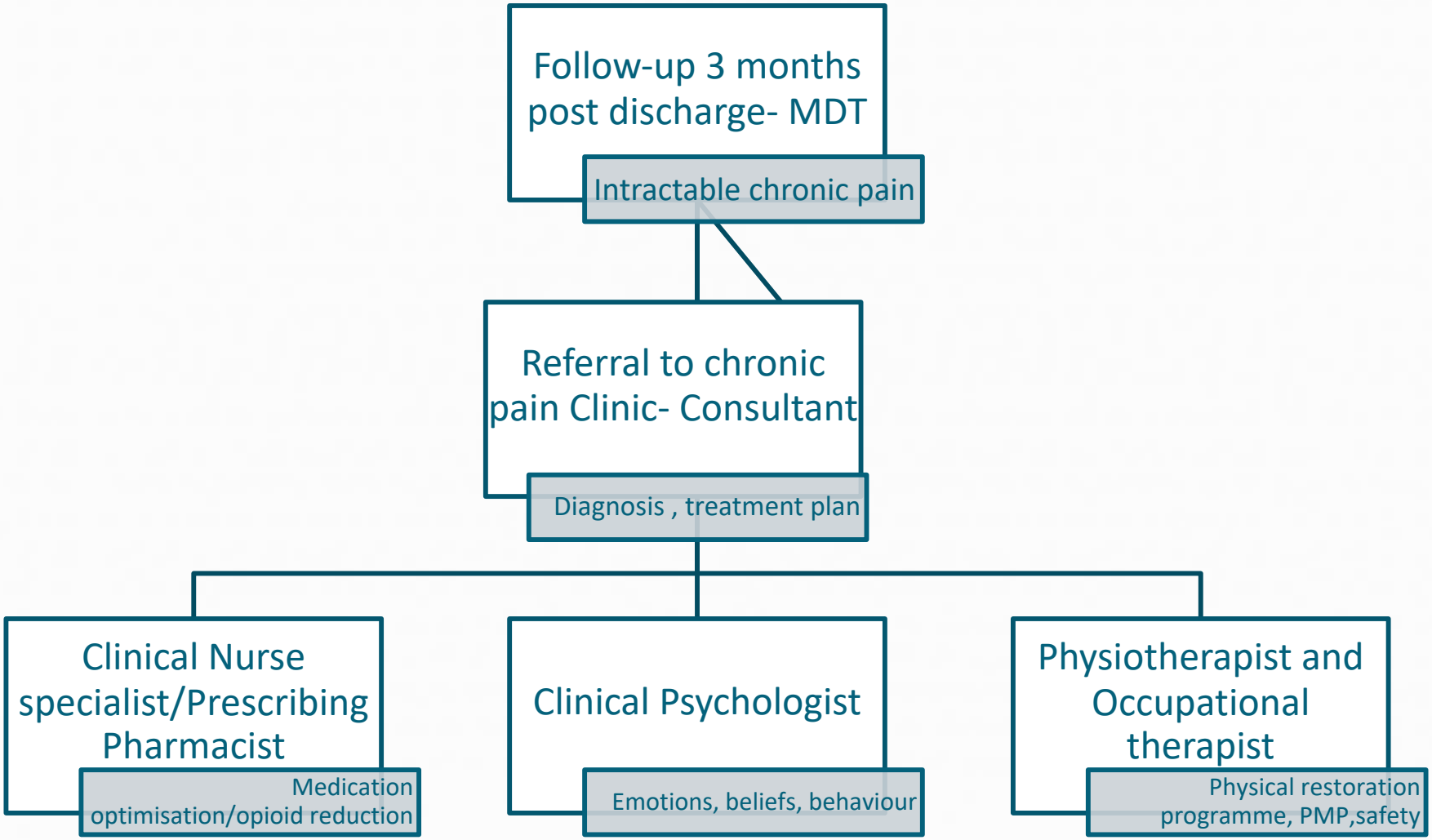
Discussion points

- While in ICU
- After discharge

While in ICU

- Introduce BPS for averbal mechanically ventilated patients
- Music therapy by headphones
- Early rehabilitation
- Opioid de prescribing
- Re-assessment of needs and doses of sedatives, antidepressants, anticonvulsants

Clinical pathway/service provision for discussion between Chronic pain service/ICU in ABUHB, Newport



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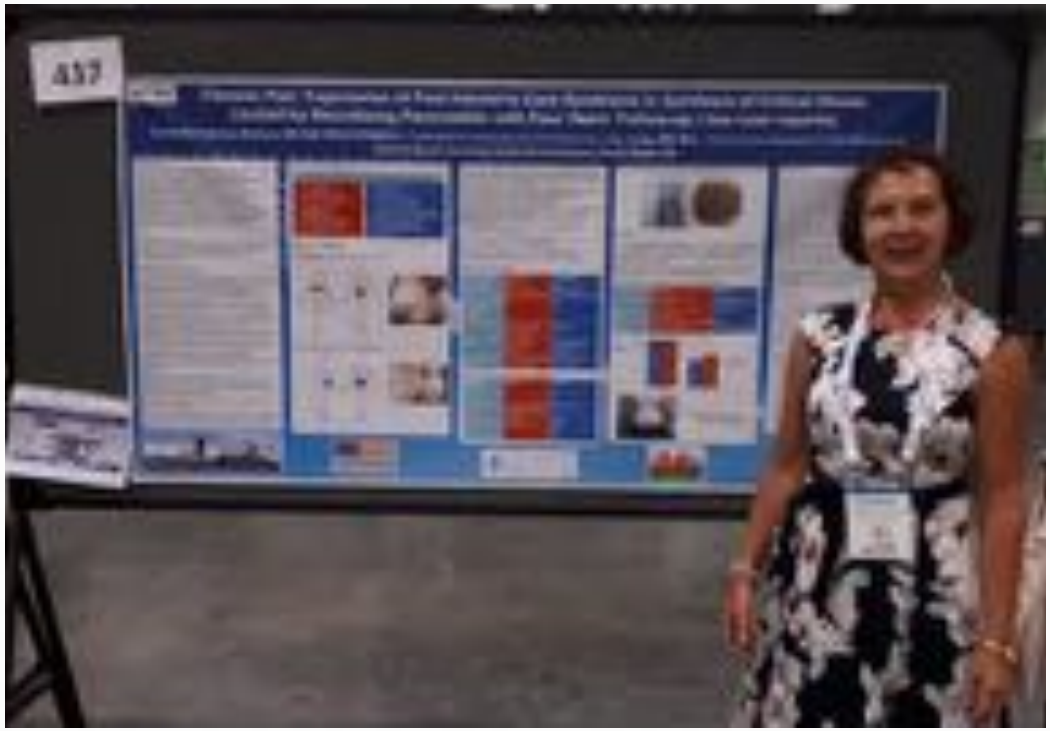


CPSP

DR. SANGRAM PATIL MD FRCA FFPMRCA

CPSP

Chronic Pain

Pain lasting beyond tissue healing, 3-6 months

CPSP (relatively new concept)

Macrae and Davies proposed specific criteria 2008

- must develop after surgery.
- at least two months duration.
- other causes excluded.
- the possibility of pre-existing condition excluded.

CPSP Burden

Macrea has estimated that UK is likely to have 41 000 new CPSP patients each year.

Its severe in 2–10%.

CPSP impact

Bio-psycho-social

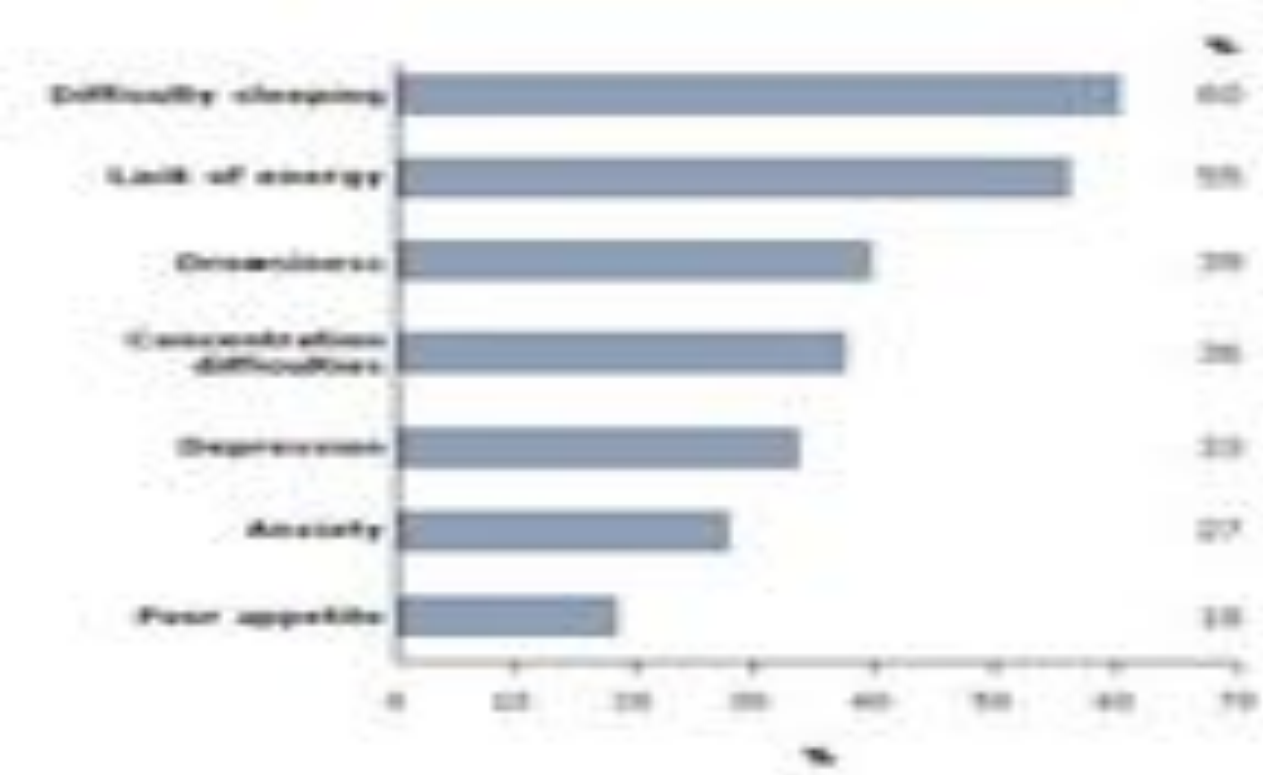
QoL

Function

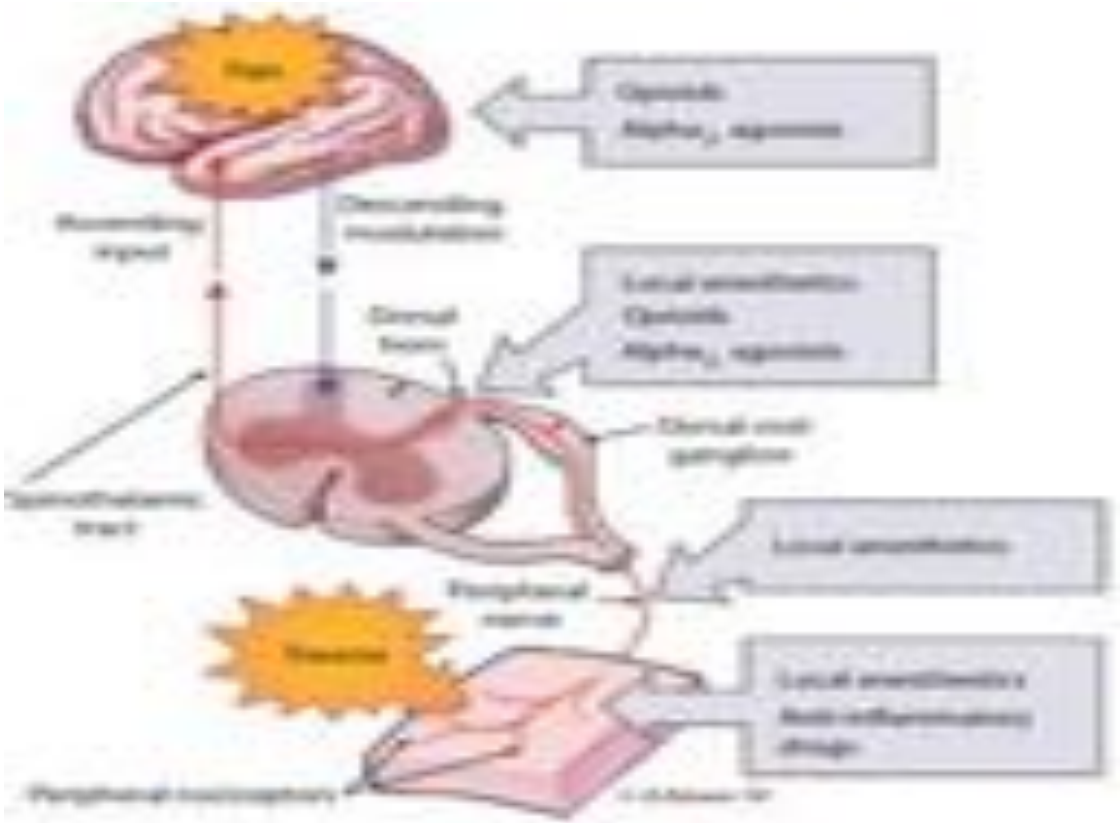
Financial

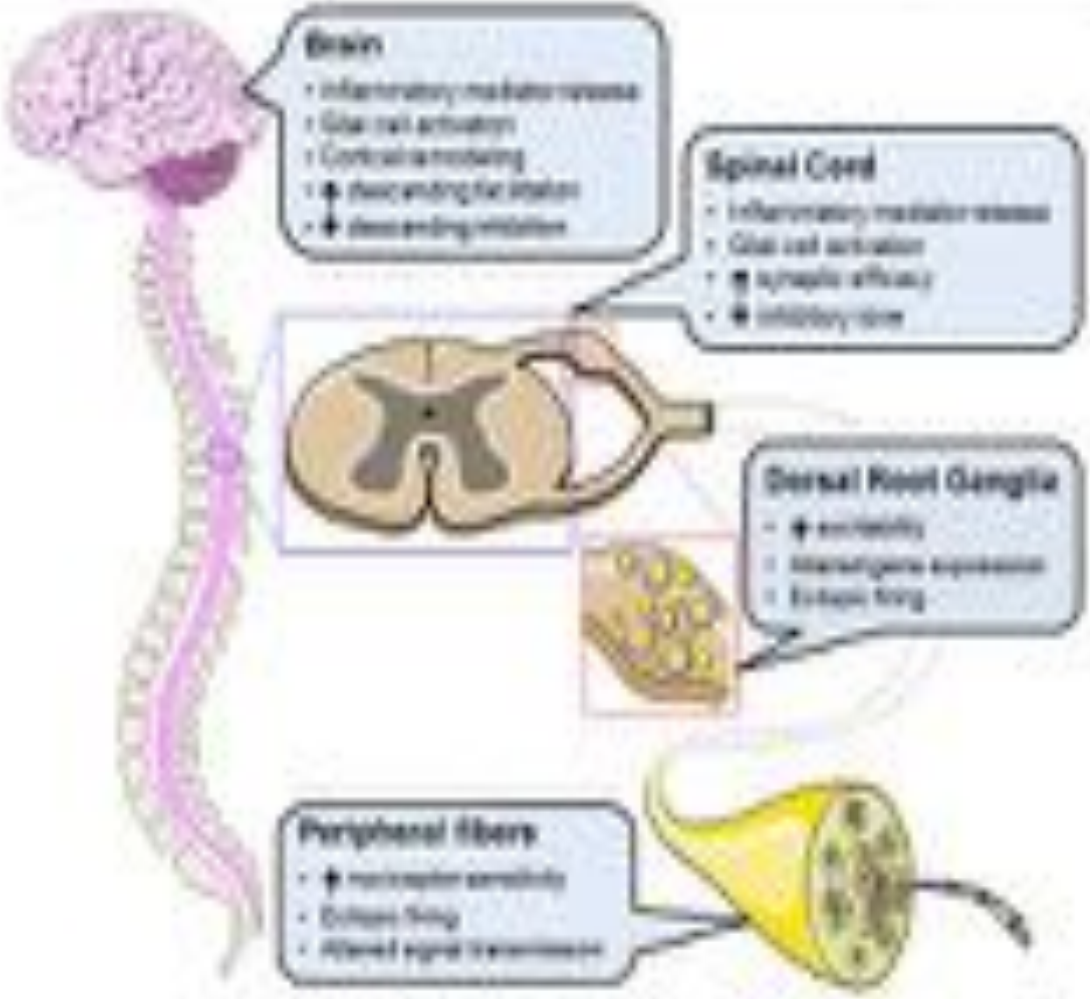
Psycho-social

Health system use



Mechanisms for CPSP

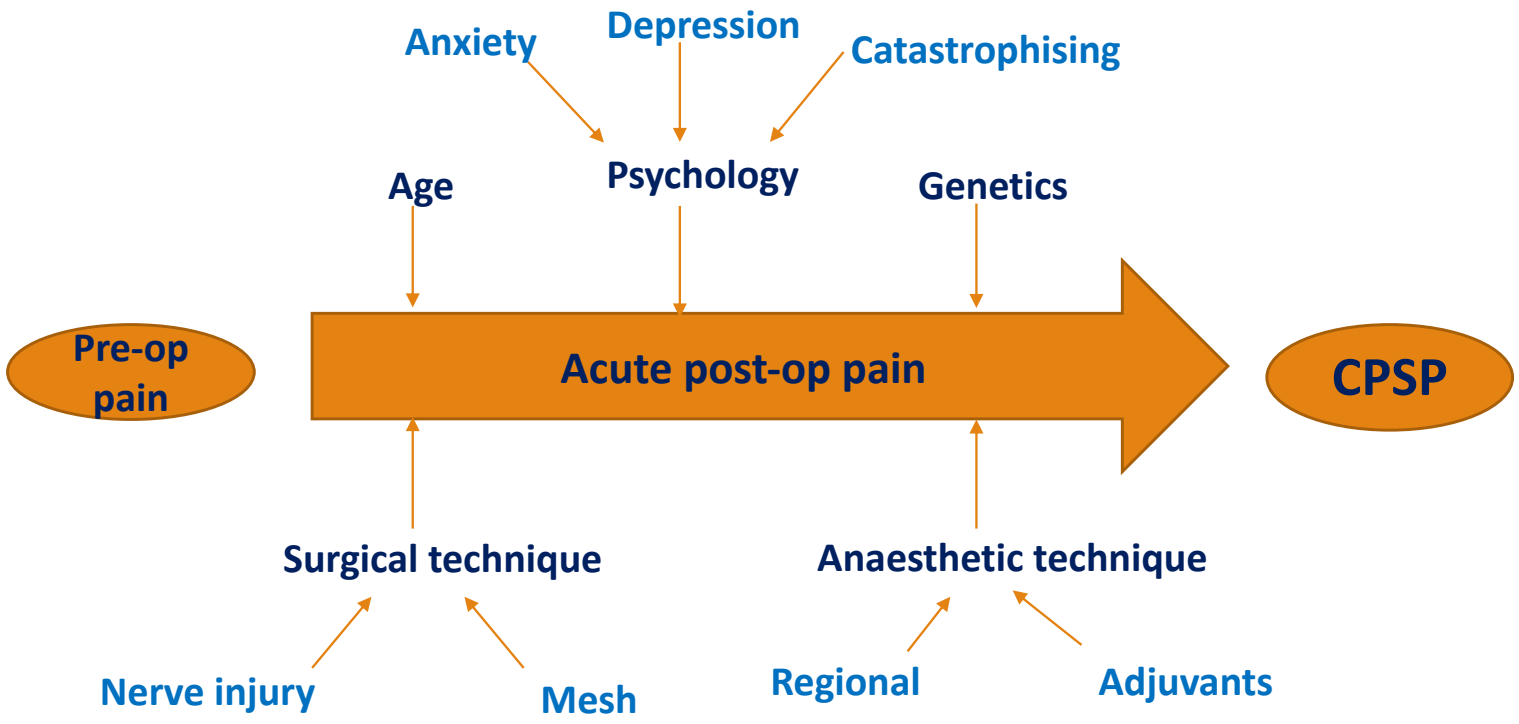



Brain
Spinal Cord
Dorsal Root Ganglia
Peripheral fibers

Predisposing factors

Preoperative factors	Pain, moderate to severe, lasting more than 1 month Repeat surgery Psychological vulnerability (eg, catastrophizing) Preoperative anxiety Female gender Younger age (adults) Workers' compensation Genetic predisposition Inefficient diffuse noxious inhibitory control (DNIC)—a descending pathway of pain inhibition
Intraoperative factors	Surgical approach with risk of nerve damage
Postoperative factors	Pain (acute, moderate to severe) Radiation therapy to area Neurotoxic chemotherapy Depression Psychological vulnerability Neuroticism Anxiety

CPSP development process



Surgical procedures & CPSP

Surgery	Incidence (%)	Reference
Inguinal hernia	12	Aasvang and colleagues[9]
CABG	44	Bar-El and colleagues[10]
Thoracotomy	52	Pluijms and colleagues[11]
Femoral popliteal bypass	23	Greiner and colleagues[12]
Pelvic trauma	48	Mayhoff and colleagues[13]
Hip arthroplasty	28	Nikolajsen and colleagues[14]
Gastrointestinal	18	Bruce and colleagues[15]
Amputation	27 - 30	Hanley and colleagues[16]
Mastectomy	48	Polanchuck and colleagues[17]

Can we do something about CPSP?

Treatment is difficult, prevention is crucial, evidence?

Patients- avoid surgery if possible.

Surgeons- poor clinical benefits, surgical time, incision, minimally invasive, nerve sparing techniques, wound catheters, enhanced recovery?

Anaesthetist- POAC, intra-operative, post-operative

Some evidence

Thoracotomy- epidural

Lower limb amputation- epidural diamorphine, clonidine, bupivacaine, prolonged wound catheters

Breast surgery- young patient, extent of surgery, radiotherapy, and increased immediate postoperative pain. PVB

Colonic surgery- epidural plus IV ketamine

Some evidence

LSCS- SAB vs GA

Nephrectomy- continuous wound local anesthetic infusion

Hernia surgery- infiltration, spinal + ketorolac for 4 days

Thyroidectomy- bilateral superficial cervical plexus block

Adjuvants and CPSP- Lidocaine IVI, gabapentinoids

Fear-avoidance model of chronic pain

Biopsychosocial multimodal approach

PLACEMENT
Perineural Local Anaesthetic Catheterisation After Major Lower Limb Amputation Trial

Nerve catheters for post-amputation pain

Dave Bosanquet, BSET Fellow, Southmead Hospital, Bristol

South Wales Network of Acute Pain Teams (SwNAP) 6th Acute Pain Conference
22nd May 2019

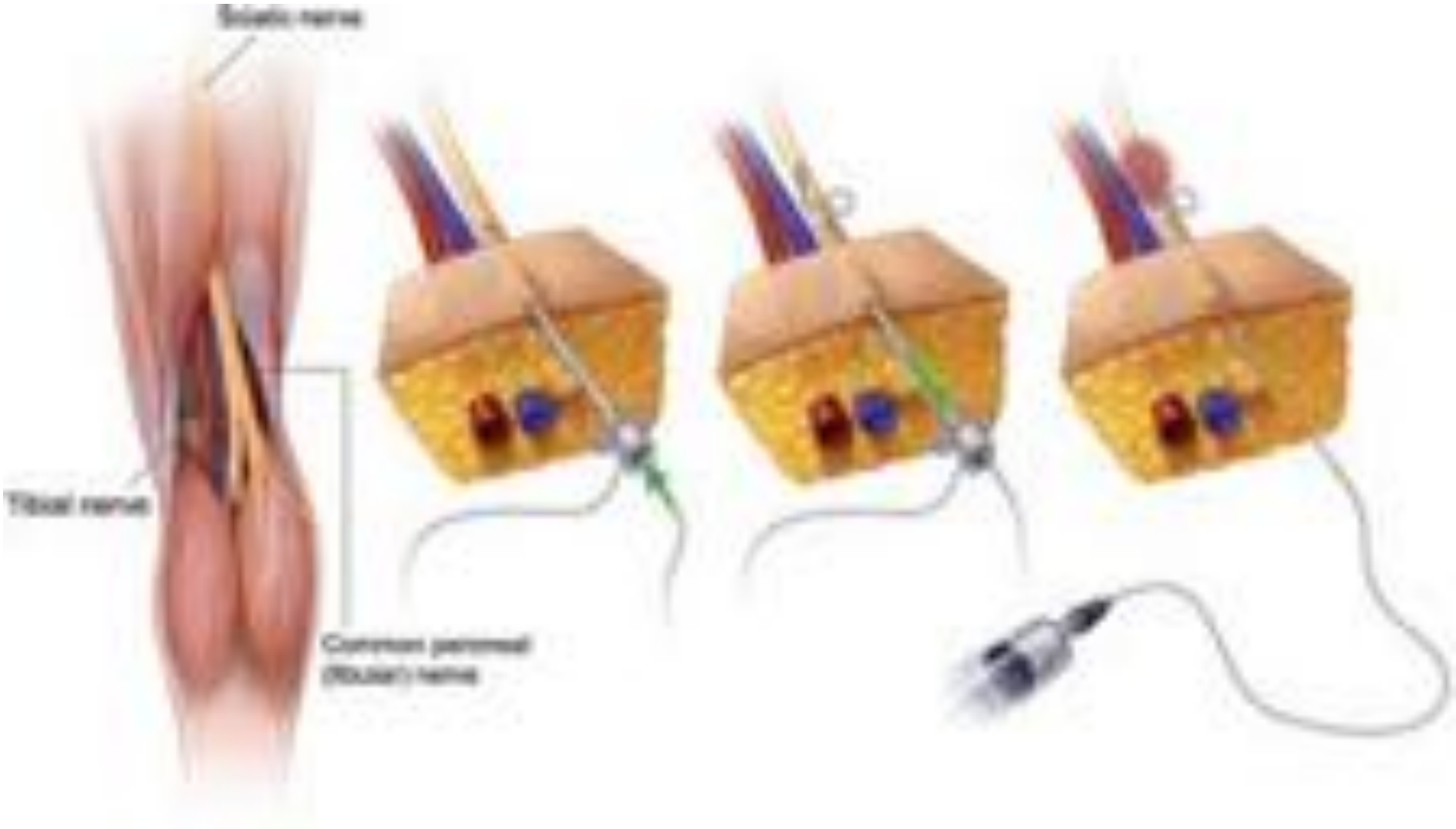
Background

- Pain control after major lower limb amputation is challenging
  - NCEPOD report found only 37% of patients reported good pain control
- Chronic stump pain (CSP) and phantom limb pain (PLP) can affect as many as 80% of patients

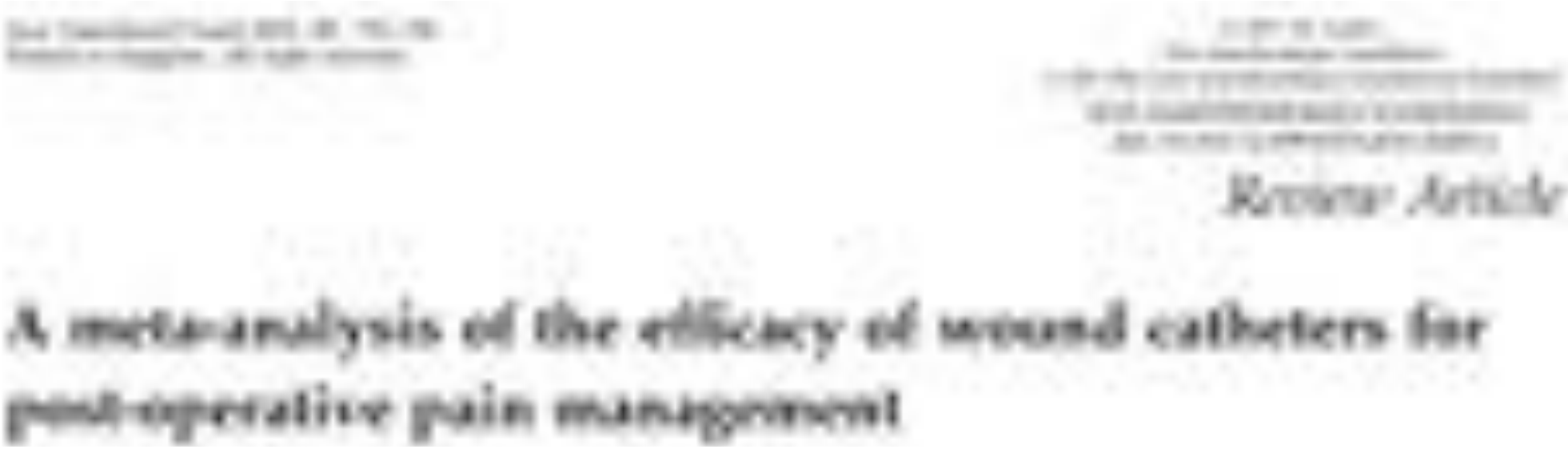
Background

- Opioids have significant side-effect profile
- Perineural catheters (PNCs) are thin plastic tubes placed adjacent to a major nerve (sciatic and tibial)
  - Easily placed at time of amputation
  - Limited evidence as to efficacy

Procedure



Background



Review Article

A meta-analysis of the efficacy of wound catheters for post-operative pain management

Reduced opiod consumption

No effects on pain

Background

Reduced opiod consumption

No effects on pain

Background

Brief history

Douglas Bader Foundation

Background

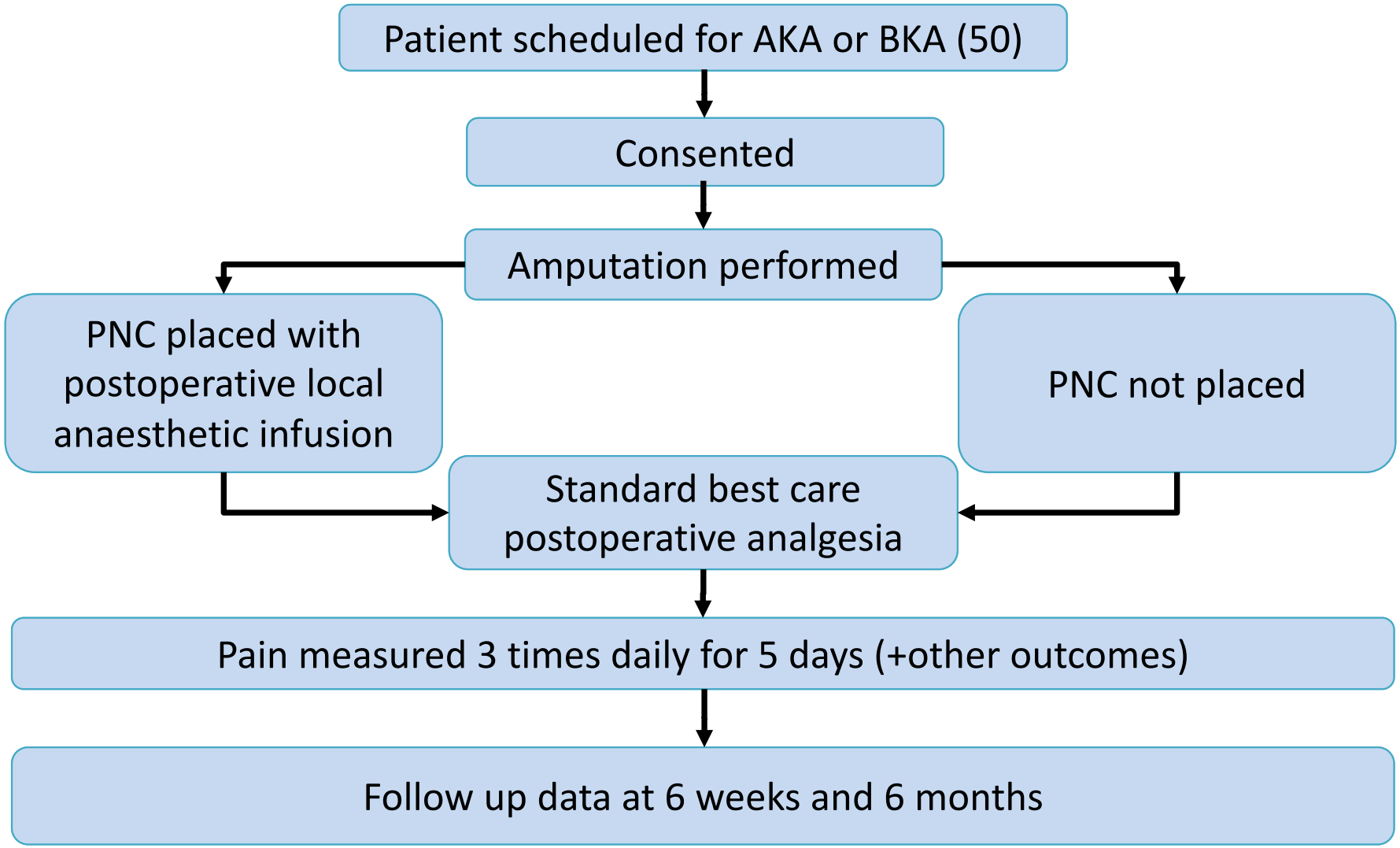
- Feasibility required because:
  - Unable to power trial from existing literature

  (pt centered outcome)
  - Unclear how best to measure pain in this population
  - Unclear what recruitment and retention rates to expect

Methods

- Fifty patients recruited at two centres in South Wales

- Pragmatic approach to anaesthetic approach
- PNC in treatment arm used to infuse 0.125% levobupivacaine at 5ml/hour for up to 5 days
- Allocation concealed from team until nerve identified


Patient scheduled for AKA or BKA (50)
Consented
Amputation performed
PNC placed with postoperative local anaesthetic infusion
PNC not placed
Standard best care postoperative analgesia
Pain measured 3 times daily for 5 days (+other outcomes)
Follow up data at 6 weeks and 6 months

Methods

- For first 5 post-operative days:
  - Pain scores (0-10 scale) 3 x daily
  - 0-3 pain scores transcribed from observation charts
  - Analgesic use recorded
  - OBAS

- Patients followed up at 2 and 6 months
  - Quality of life (EQ-5D-5L)
  - Resource use
  - CSP and PLP questionnaires

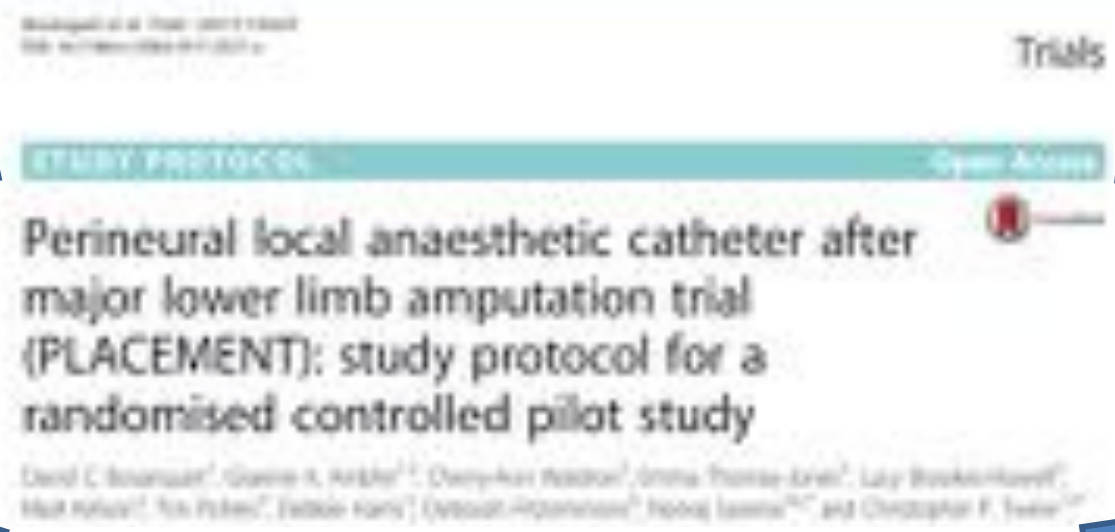
Outcomes

- Proportion of eligible patients recruited
- Proportion of patients providing:
  - Primary outcome (at least 9 pain scores over 5 days)
  - Secondary outcomes up to 6/12
- Estimate effect size and sample size
- Identify key cost drivers
- Secondary outcome assessment what's important, how to measure)

Assessing feasibility

Qualitative patient interviews

Qualitative staff interviews



Adequate recruitment, randomisation and primary outcome

Review against Acceptance Checklist for Clinical Effectiveness Pilot Trials (ACCEPT) criteria

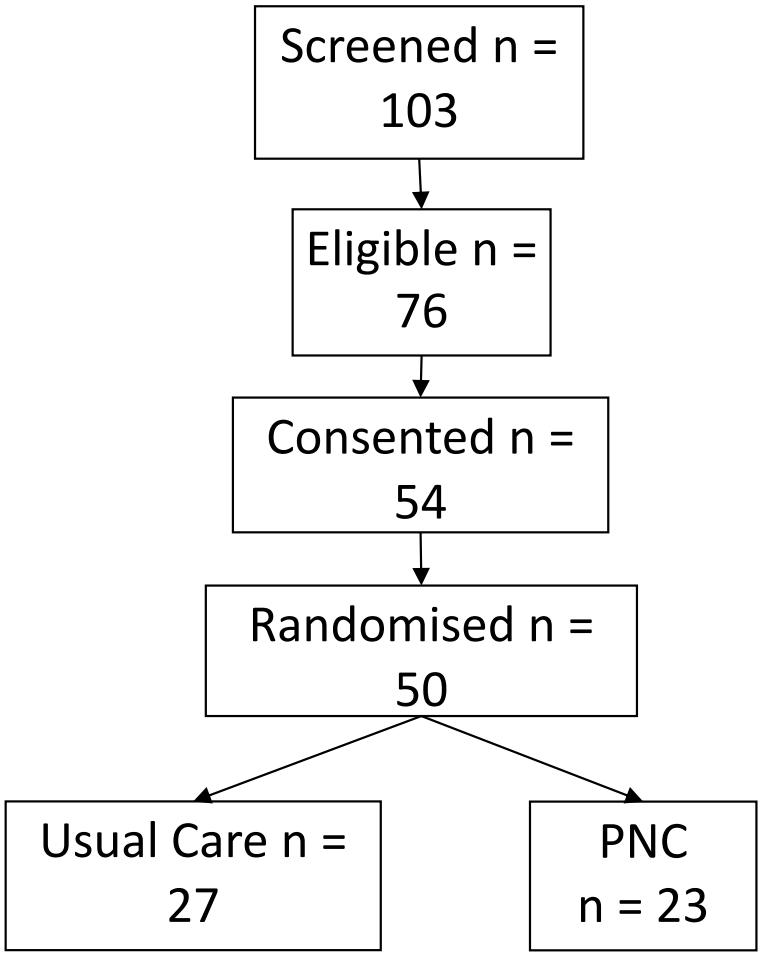
Parallel work

- Development of COS
  - Systematic review and ID of reported outcomes
  - Qualitative interviews with key stakeholders
  - Development of key topics
  - Delphi process

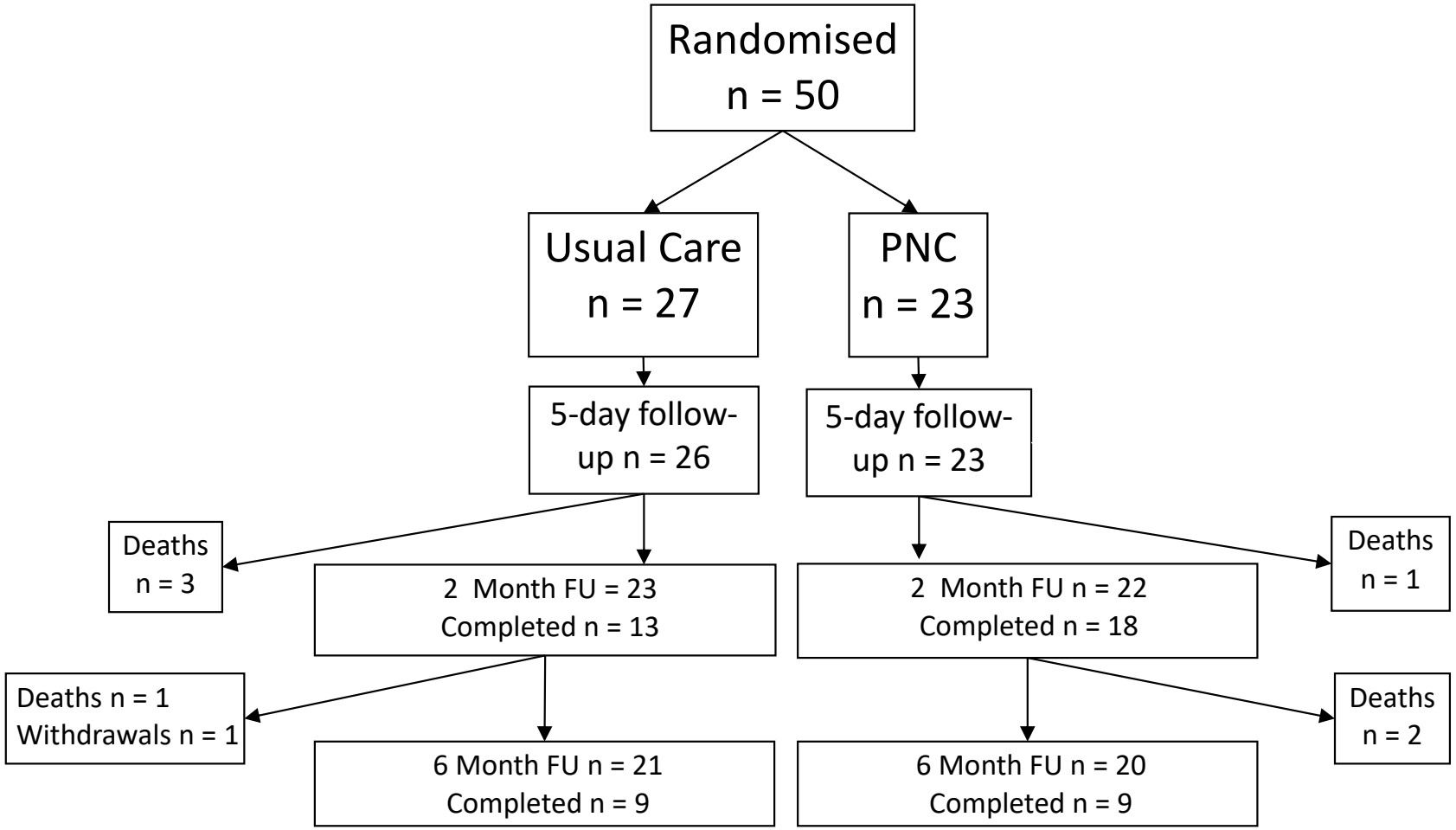
Timetable

- First patient recruitment Feb 2017
- Recruitment finished Nov 2017
- Data collection complete May 2018
- Results available August 2018
- Submitted for publication Jan 2019
- COS completed in April 2019

Consort


Screened n = 103
Eligible n = 76
Consented n = 54
Randomised n = 50
Usual Care n = 27
PNC n = 23

Consort


Randomised
n = 50
Usual Care
n = 27
PNC
n = 23
5-day follow-up n = 26
5-day follow-up n = 23
Deaths
n = 3
2 Month FU = 23
Completed n = 13
2 Month FU n = 22
Completed n = 18
Deaths
n = 1
Deaths n = 1
Withdrawals n = 1
6 Month FU n = 21
Completed n = 9
6 Month FU n = 20
Completed n = 9
Deaths
n = 2

Results – early outcomes

- 34/49 patients had at least nine 11-point pain scores available
- 45/49 patients had at least nine 4-point pain scores available
- Opioid use well captured

Results – early outcomes

Pain score	Usual Care (n=23)	PNC (n=22)
None	11	14
Mild	6	5
Moderate	3	2
Severe	3	1

- Odds ratio 0.495 (95% C.I. 0.158-1.554)
- Estimated sample size **207** (α=0.05, β=0.9, 10% loss)

Results – early outcomes

- Pain treatment failure more likely in PNC group
- Less opioids in treatment arm
- SSIs equivalent

Results – late outcomes

- Attrition at later follow-up was high
  - 27 patients evaluated PLP/CSP at 2 months
  - 14 patients evaluated PLP/CSP at 6 months

- Assessment of QoL and cost:
  - 28 patients returned EQ-5D-5L and costs at 2 months
  - 14 patients returned EQ-5D-5L and costs at 6 months

- No difference in QoL
- Major driver of cost is inpatient stay

Lessons learnt so far

- Recruitment of patients is feasible
- A full effectiveness trial is practical
- Intervention safe
- Assessment of chronic/phantom pain at follow-up is difficult
- Assessment of costs should rely on routine health databases, not patient reports


PLACEMENT
Perineural Local Anaesthetic Catheterisation
After Major Lower Limb Amputation Trial

How do we define what is important to measure in trials

- Development of a Core Outcome Set
  - Systematic review and ID of reported outcomes
  - Qualitative interviews with key stakeholders
  - Development of key topics
  - Delphi process

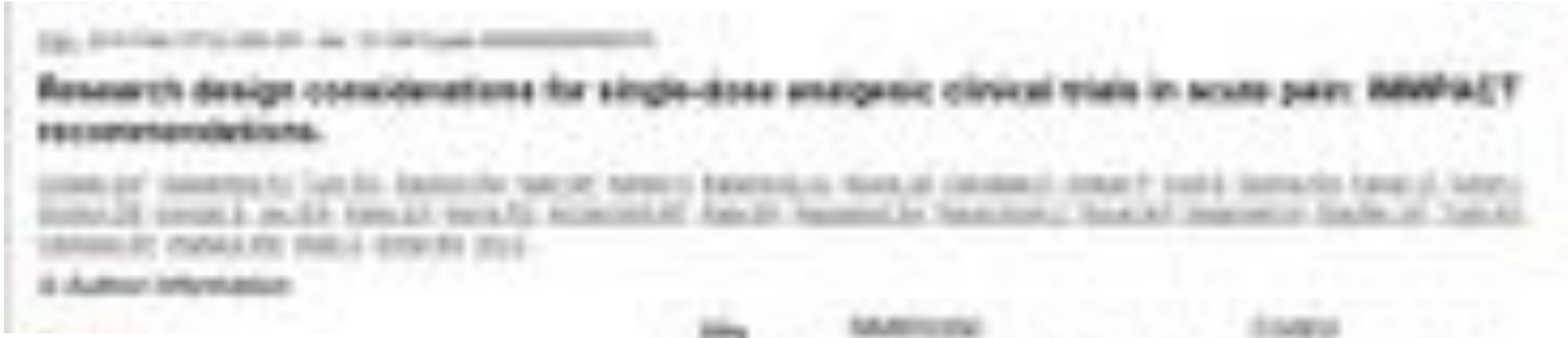
- Even more specific: Core Outcome Measures

Core Outcome Measures

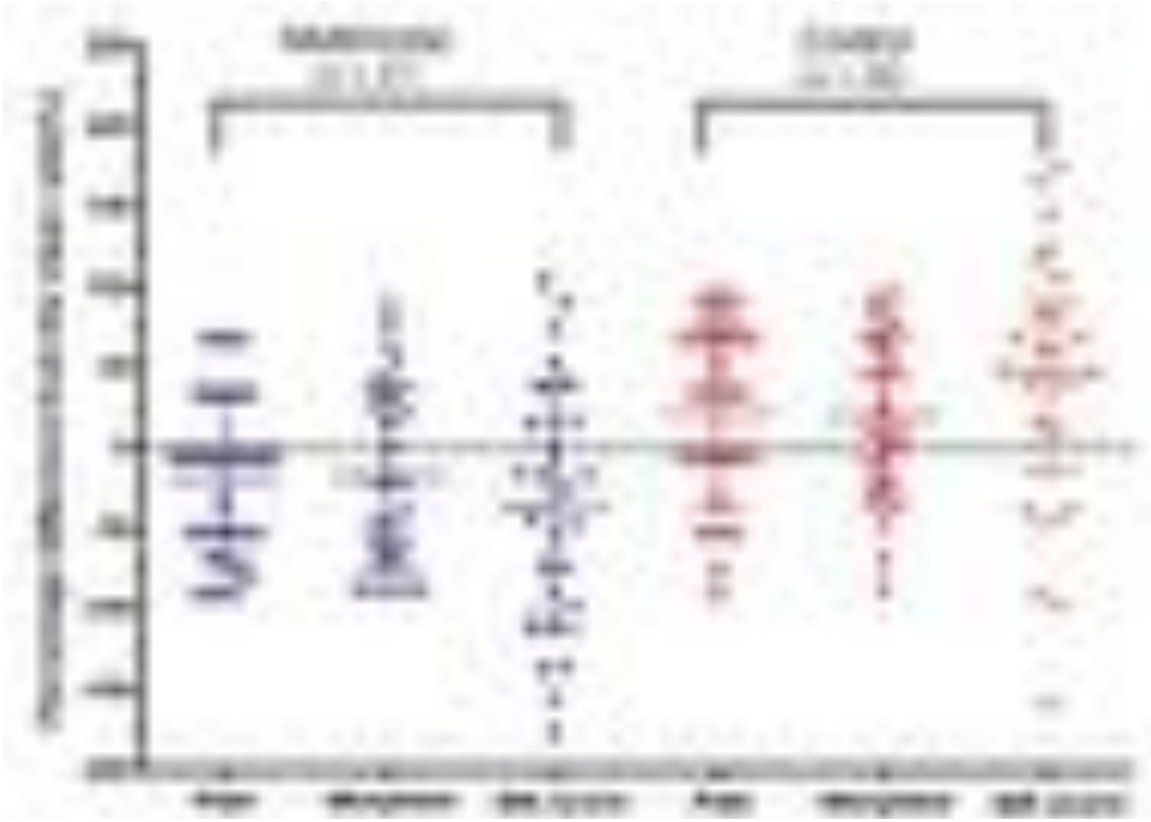
How to measure pain

- No standardised method of assessing pain
  - Major options 0-10; 0-3; VAS/VRS
  - No. times/day
  - At rest/movement
- No standardised method of analysing pain
  - Median/mean
  - AUC
  - Time spent above threshold
  - Worse pain
  - Dichotomised outcome

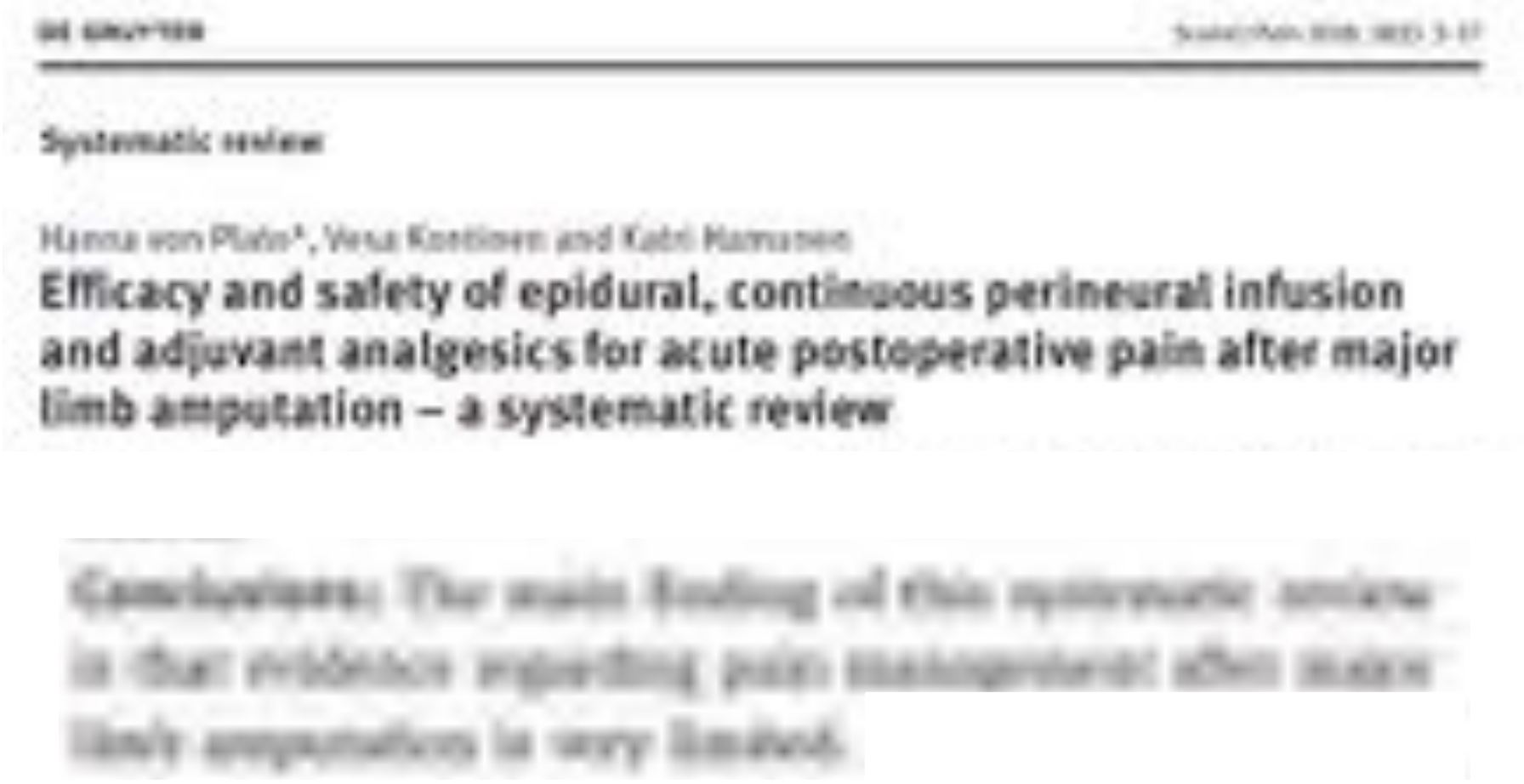
Current advice



- NRS 0-10 generally the best record of pain
- Need to account for baseline pain
- Movement evoked pain less reported than pain at rest
- Functional outcomes may be crucial in certain trials (DOMS)



Other interventions for amputees



Systematic review

Hanna von Plato*, Vesa Kontinen and Kati Kamunen

Efficacy and safety of epidural, continuous perineural infusion and adjuvant analgesics for acute postoperative pain after major limb amputation – a systematic review

Conclusions: The main finding of this systematic review is that evidence regarding pain management after acute limb amputation is very limited.

Anaesthetic type

Spinal or general anaesthesia for lower-limb amputation in peripheral artery disease – a retrospective cohort study

What else can be done?

- Pre-operative epidural catheter, continued for 48 hours
- IV Ketamin or calcitonin
- Oral gabapentinoids
- Novel surgical technique


PLACEMENT
Perineural Local Anaesthetic Catheterisation
After Major Lower Limb Amputation Trial

Acute Post-operative Pain Management in Paediatrics

M.Cole
Locum Consultant Anaesthetist
Royal Glamorgan Hospital

Full disclosure…

- I am **NOT** a specialist in pain!

Aims

- Problems in paediatrics:
  - Diagnosing pain
  - Measuring pain effectively
  - Appropriate discharge from recovery/PACU
- Current practise in paediatrics
- Useful guidelines I use
- Future prospects for paediatric peri-operative analgesia

When pain isn't pain

- How can we distinguish post-op pain from a myriad of other post-op problems?

Some post-op causes of distress

- **Peri-operative Anxiety**
- **Post-operative delirium**
- Partial reversal of paralysis
- Hypoxia
- Partial/complete airway obstruction
- Nausea and vomiting
- Upper airway/tonsillectomy bleeding
- Separation anxiety
- Disorientation
- Packs/drains/lines
- Inability to express concerns/comprehend
- Full bladder

Peri-operative anxiety

- **"Anxiety is a psychological and physiological state characterized by somatic, cognitive and behavioural components"**

- 80% of children admitted to hospital experience anxiety
- 75% experience it in an anaesthetic room
- Up to 60% will display NEW dysfunctional behaviour within 3 weeks of surgery
- Use of physical restraint increases this rate to >70%
- Up to 12% still display dysfunctional behaviour 1year after surgery!

How might this present?

Pain

- Chest pain
- Headaches
- Neck ache
- Low back pain
- Muscle pain
- Aching Jaw
- Chronic pain

Dissociative

- Feelings of:
  - Detachment from body
  - Surroundings being unreal
  - "Looking through a fog"
- Tunnel vision
- Temporary paralysis
- Sensitivity to light/sound

Emotional

- Episodes of rage
- Frustration
- Confusion
- Deep sadness
- Depression
- Feelings of guilt/emptiness/loneliness/helplessness
- Increased worry

Systems Based

CVS:

- Palpitations/missed beats
- Pounding heart

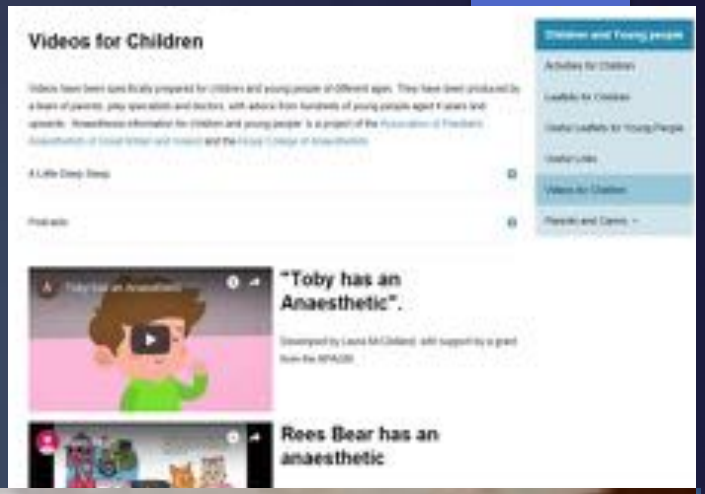
Respiratory:

- Dry mouth
- SOB
- Choking sensation/Tightening of throat
- Hyperventilation
- Feel "as if I cant take another breath

What can we do about it?

Non-Pharmacological Methods

- Develop Coping strategies
- Pre-operative Preparation Programmes
- Communication:
  - Verbal techniques
  - Non-verbal techniques
- Modify Environment
- Teamwork
- Parental impact
- (Hypnosis)



Pharmacological Methods

- Pre-medication:
  - **Analgesics** – simple painkillers, weak opiods, strong opiods, adjuncts
  - **Anxiolitics** – benzodiazepines, alpha-agonists, NMDA receptor antagonists
  - **Sedatives** – most of the above!

Commonly Used Pre-medications

- Midazolam
  - Dose: 0.5mg/kg PO
  - Mechanism: GABA receptor agonist
  - Side Effects/problems:
    - Bitter taste
    - Mild CVS and respiratory depressant
    - Paradoxical hyperexcitability
- Clonidine
  - Dose: 3-5micrograms/kg PO
  - Mechanism: $\alpha 2$-agonist
  - Side Effects;
    - Hypotension
    - Dry mouth
    - Dizziness
- Ketamine
  - Dose: 5mg/kg PO
    - 5-10 mg/kg IM
  - Mechanism: NMDA receptor antagonist
  - Side Effects:
    - Delirium
    - Hallucinations
    - Increased secretions
    - Increase ICP

Emergence delirium

- A drug induced disorientation
- Transient state of marked irritation and disassociation after the discontinuation of anaesthesia in some patients
- Doesn't respond to consoling measures
- Begins as the child awakens and usually lasts <30mins
- Usually Self limiting
- Incidence ranges from 10-50% (up to 80%)

Symptoms:

- Crying or Screaming
- Uncooperative
- Inconsolable
- Thrashing Around
- Child may be Hallucinating
- Child often doesn't appear to recognise their parents

- Implications
  - Distressing for everyone
  - Risk of injury to the child
  - Requires more resources
  - Longer discharge from recovery
- But remember it is usually self limiting and lasts <30 mins

Risk Factors

- Patient
  - Age – most common in 2-5 year olds
  - Child temperament – emotional or impulsive children, less social
  - Preoperative anxiety
- Anaesthetic
  - Short acting Volatile Anaesthetic – Sevo/Desflurane
  - Short cases
  - Rapid emergence
  - Reduced risk with ketamine, fentanyl, clonidine and preoperative analgesia
  - Midazolam pre-med – if awakes before it has worn off
- Surgical
  - ENT and Ophthalmology have been shown to have an increased risk
  - Post operative pain can be a contributing factor

Prevention

- Identify at risk patients
- Minimise starvations times
- Minimise peri-operative anxiety - ? Pre-med role
- Minimise opiate use
- TIVA vs volatiles

Management

- N
  -
  -
  -
  -

can

0.5-2

g/kg

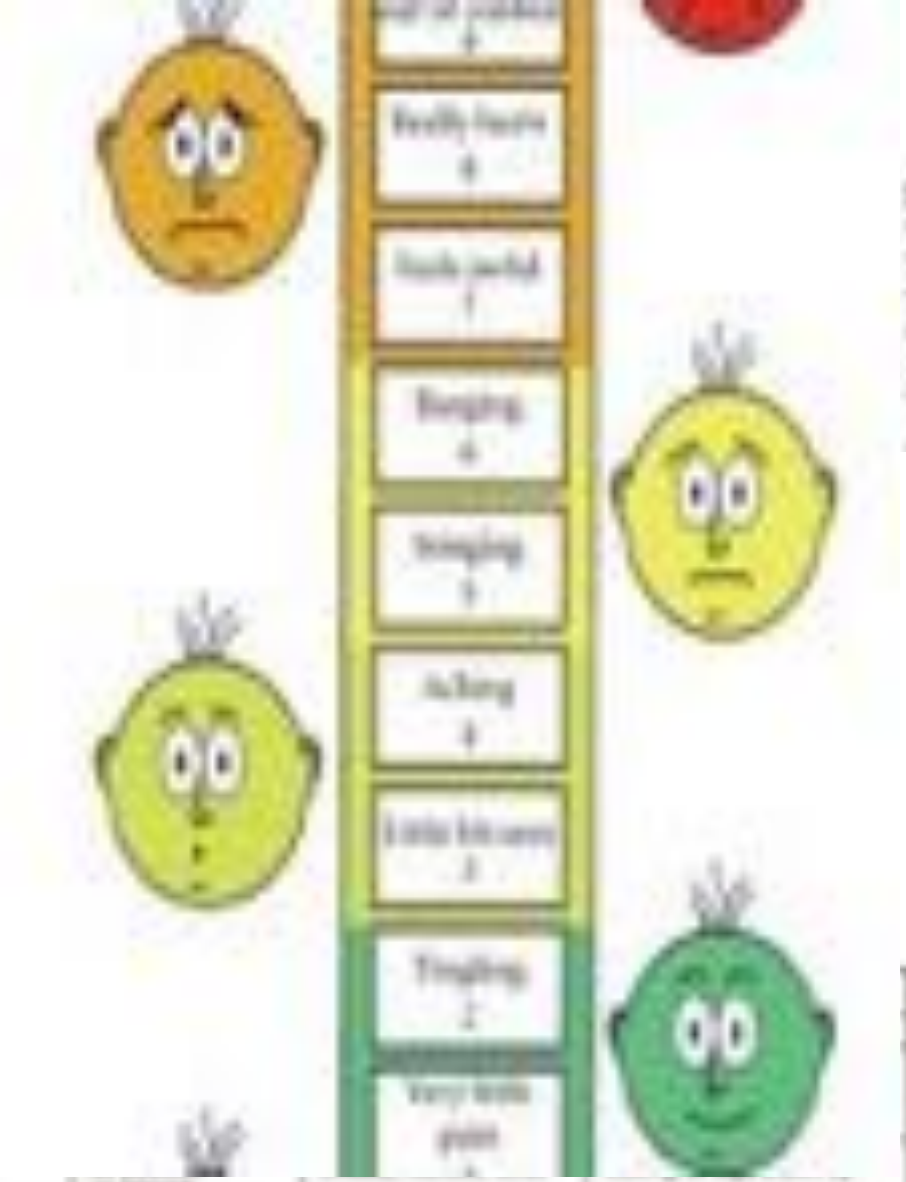
effective

ctive)

Some cases only improve if the child can be made to sleep for 10-15mins and re-awaken gradually

Measuring pain in Paediatrics

- How can we rate pain effectively?
- When is pain low enough to discharge from recovery?
- Functional activity scoring



Neonatal Infant Pain Scale (NIPS)

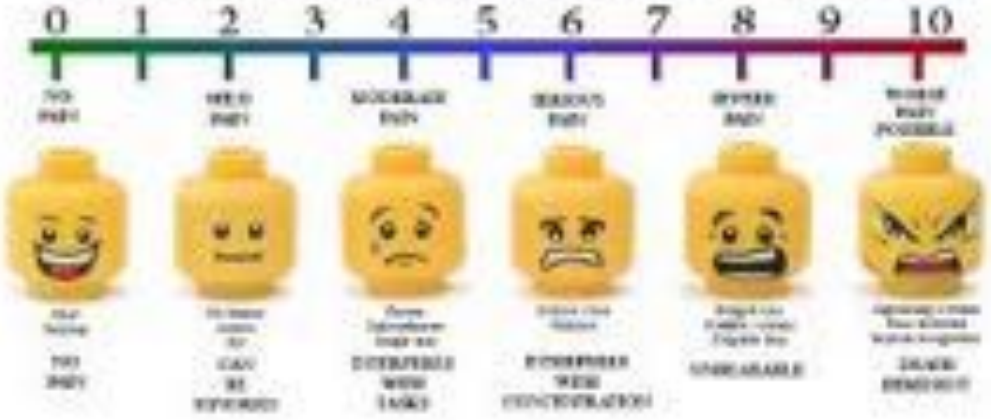
NIPS	0 point	1 point	2 points
Facial expression	Relaxed	Contracted	–
Cry	Absent	Mumbling	Vigorous
Breathing	Relaxed	Different than basal	–
Arms	Relaxed	Flexed/stretched	–
Legs	Relaxed	Flexed/stretched	–
Alertness	Sleeping/calm	Uncomfortable	–

NIPS	FPPS	FPPS	linear
COMFORT	Nurse	[illegible]	analogue
CHEOPS	observation	Poker chip	Adjective self
UBS	Parental	Colour scales	report

Activity	[illegible]	[illegible]	[illegible]
Cry	[illegible]	[illegible]	[illegible]
Consolability	[illegible]	[illegible]	[illegible]

Each of the five categories (F) Face, (L) Legs, (A) Activity, (C) Cry, (C) Consolability is scored from 0-2, which results in a total score between 0 and 10.

LEGO PAIN ASSESSMENT TOOL



Deciding When It's Okay to Discharge…

- ***Not all patients leaving a PACU will be "pain free"***

- Questions I would ask myself:
  - Is the pain dramatically different from baseline?
  - Is it getting better or worse?
  - Can the patient manage essential functions e.g. deep breathing/drinking/eating?
  - Do I think there's another cause for the pain?
  - Does the patient need other speciality review?
  - Are there alternative techniques I could use?

Functional Activity Scoring

- A potential shift from pain as the "5th Vital Sign" in the wake of American opioid epidemic
- A potential option in paediatric practise

Australian Functional Pain Score:

A: No limitation – able to undertake activity without limitation due to pain (0-3)

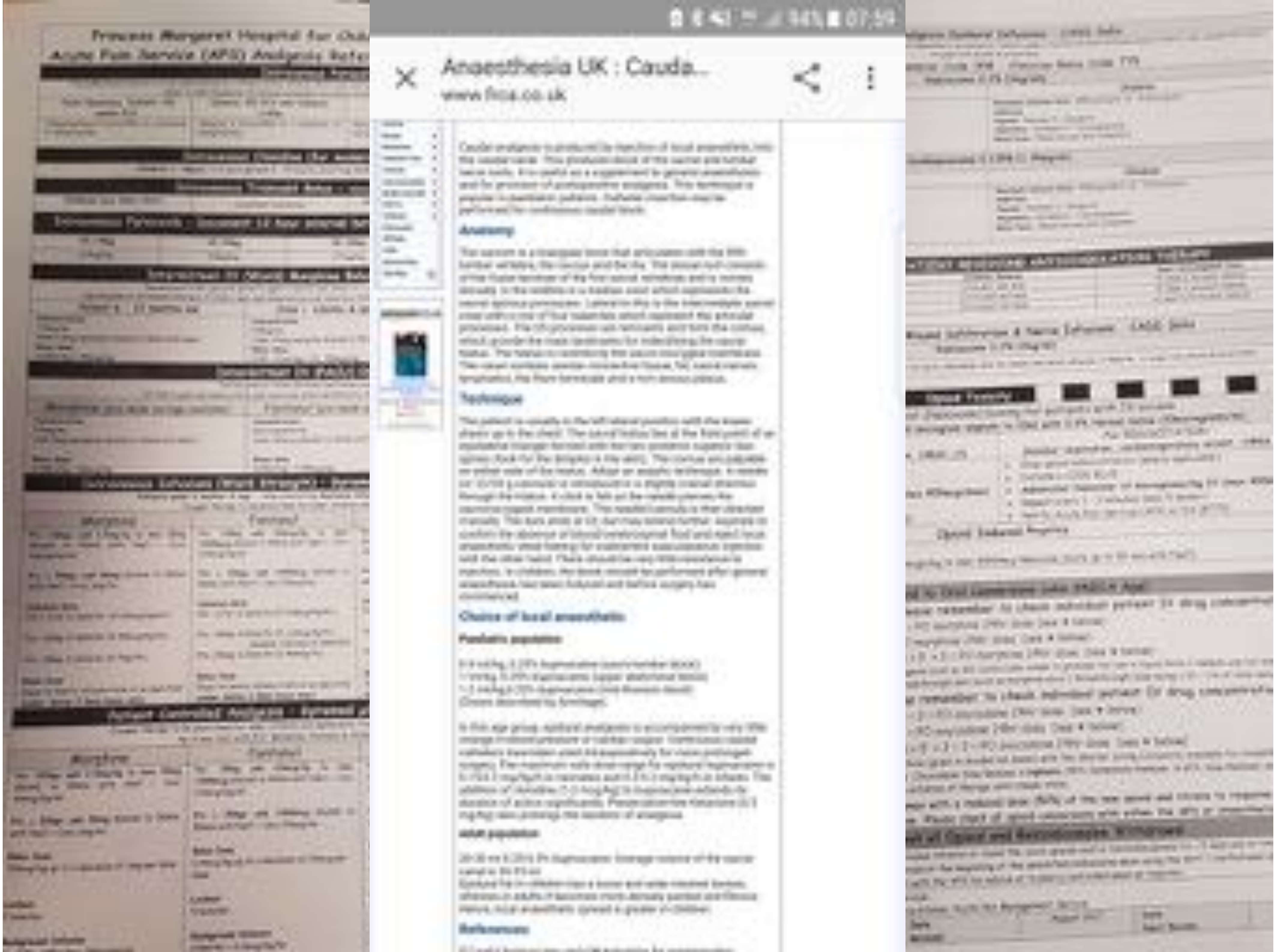
B: Mild-moderate limitation – able to undertake the activity but experiences moderate to severe pain (4-10)

C: Severe limitation – unable to complete the activity due to pain or pain-treatment related adverse effects, independent of pain intensity scores

My Current Practise

- Pre-operatively:
  - Assess baseline level of pain
  - Assess for anxiety
  - Pre-medicate:
    - Paracetamol 15-20mg/kg PO
    - Ibuprofen – age based dosing as per BNFc
    - +/- Anxiolytic (most commonly midazolam 0.5mg/kg PO)

- Intra-op:
  - Regional anaesthesia wherever possible
  - Caudal if possible
  - Clonidine 1mcg/kg if high risk for emergence delirium (or bolus propofol 1mg/kg at end of procedure)
  - Titrate opiates – to RR if possible to keep SV
- Post-op:
  - Assess need for further opiates in PACU/Recovery – avoid where possible
  - Early return of parents
  - Consider other causes of distress


Princess Margaret Hospital for Chi
Acute Pain Service (APS) Analgesia Refe
Anaesthesia UK : Cauda...
www.frca.co.uk
Anatomy
Technique
Choice of local anaesthetic
Paediatric population
Adult population
References
Morphine
Fentanyl

The future...

Paediatric Tramadol

Regional Anaesthesia

British Journal of Anaesthesia 113 (3): 375–90 (2014)
Advance Access publication 6 June 2014 · doi:10.1093/bja/aeu156

BJA

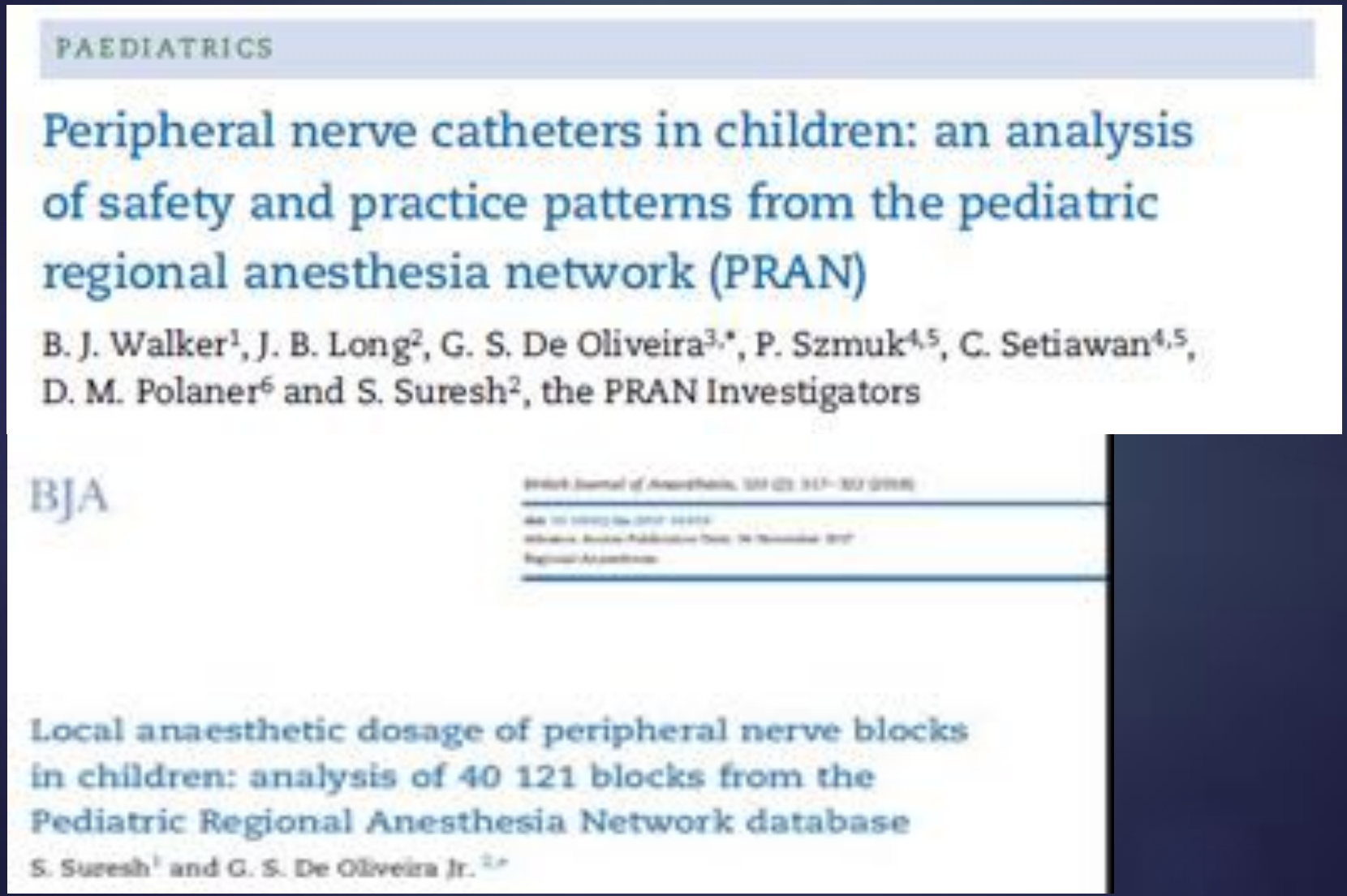
Regional anaesthesia to improve pain outcomes in paediatric surgical patients: a qualitative systematic review of randomized controlled trials

S. Suresh[1], K. Schaldenbrand[1], B. Wallis[2] and G. S. De Oliveira Jr[2]*

- Meta-analysis of RCTs of regional anaesthesia in paediatrics unclear as to benefit (lack of RCTs)
- However regional techniques widely used successfully in both adults and paediatrics
- Catheter techniques used in variety of adult procedures
- Why not in paediatrics?

Regional Catheters

- PRAN Network in America publishing plenty of info...



PAEDIATRICS

Peripheral nerve catheters in children: an analysis of safety and practice patterns from the pediatric regional anesthesia network (PRAN)

B. J. Walker[1], J. B. Long[2], G. S. De Oliveira[3,*], P. Szmuk[4,5], C. Setiawan[4,5], D. M. Polaner[6] and S. Suresh[2], the PRAN Investigators

BJA

Local anaesthetic dosage of peripheral nerve blocks in children: analysis of 40 121 blocks from the Pediatric Regional Anesthesia Network database

S. Suresh[1] and G. S. De Oliveira Jr.[2,*]

Barriers to catheter use

- Resources
- Protocols
- Familiarity
- Infrastructure
- Difficult to use a sole technique in children!

Neurodevelopmental outcome at 5 years of age after general anaesthesia or awake-regional anaesthesia in infancy (GAS): an international, multicentre, randomised, controlled equivalence trial

Mary Ellen McCann, Jurgen C de Graaff, Liam Dorris, Nicola Disma, Davinia Withington, Graham Bell, Anneke Grobler, Robyn Stargatt, Rodney W Hunt, Suzette J Sheppard, Jacki Marmor, Gaia Gallubati, David C Bellinger, Penelope L Hartnoma, Pollyanna Hardy, Geoff Frawley, Francesca Izzo, Britta S von Ungern-Sternberg, Anne Lynn, Niall Wilton, Martin Mueller, David M Polaner, Anthony R Absalom, Peter Szmuk, Neil Morton, Charles Berde, Sulpicio Soriano, Andrew J Davidson, for the GAS Consortium*

- GAS Trial – Lancet 2019
  - International, multicentre, equivalence, RCT
  - Aimed to establish whether GA in early infacy affects neurodevelopmental outcome
  - 4023 infants screened
  - 722 randomly allocated
- <1hr GA in infancy had no significant impact

Virtual Reality

- Immersive VR an increasingly available technology
- Many studies across acute pain, chronic pain and peri-operative anxiety
- Strong evidence still lacking but watch this space...

Questions

References

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- https://ww2.health.wa.gov.au/Media-releases/Chocolate-for-trial-to-help-medicine-go-down
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SwNAP Annual conference 22nd May 2019

Peri-operative management of Chronic pain patients.

Dr Sunil Dasari
Locum Consultant,
Anaesthesia and Pain Medicine
University Hospital of Wales, Cardiff.

Background

Problems involved

How to manage

Background

Patient groups

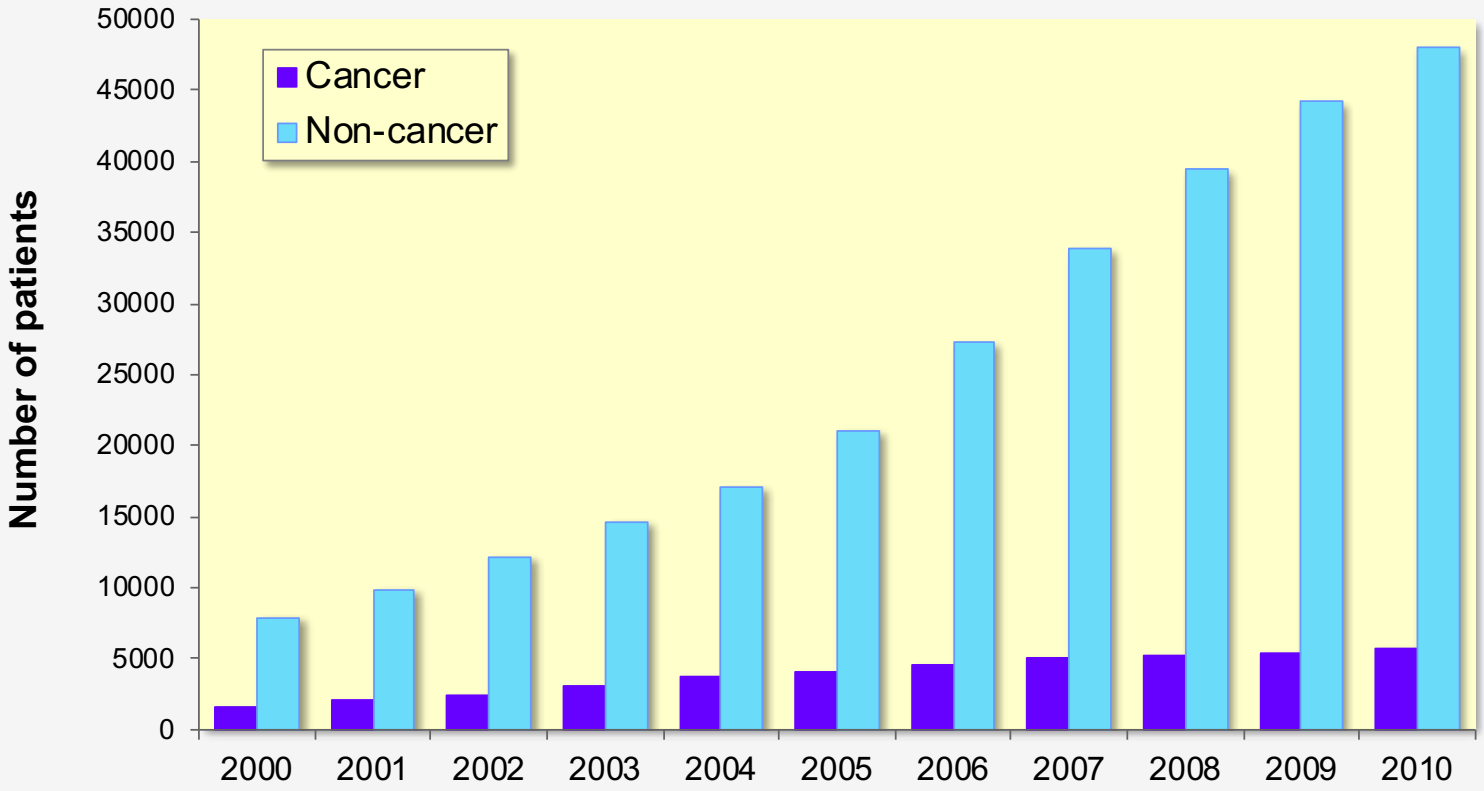
Chronic pain

- Nociceptive
- Neuropathic

Non-Cancer pain

Cancer pain

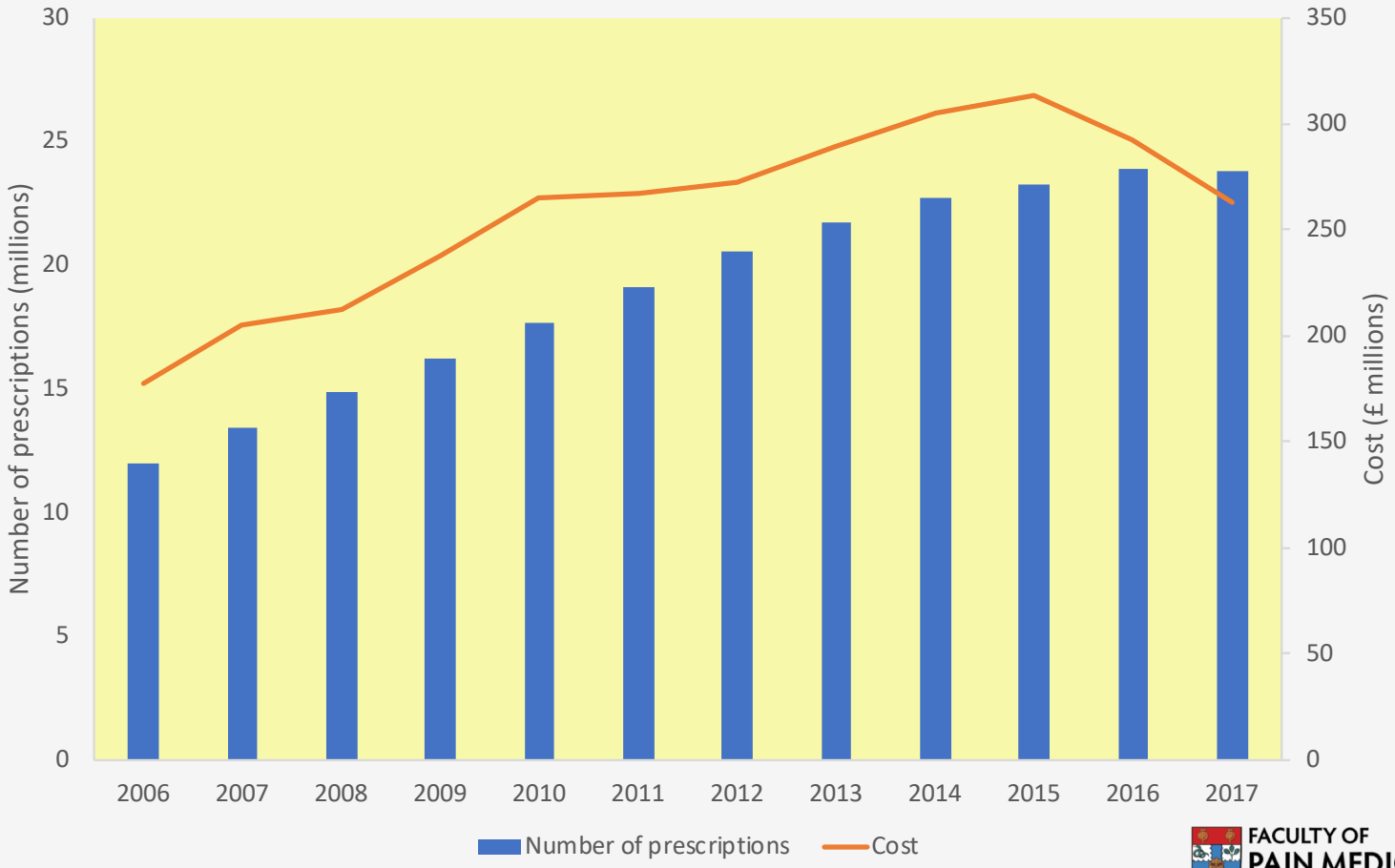
Number of patients prescribed opioids



Zin C et al. Eur J Pain 2014; 18: 1343 – 1351.

FACULTY OF PAIN MEDICINE of the Royal College of Anaesthetists

Opioid prescriptions dispensed in the community in England 2006-17



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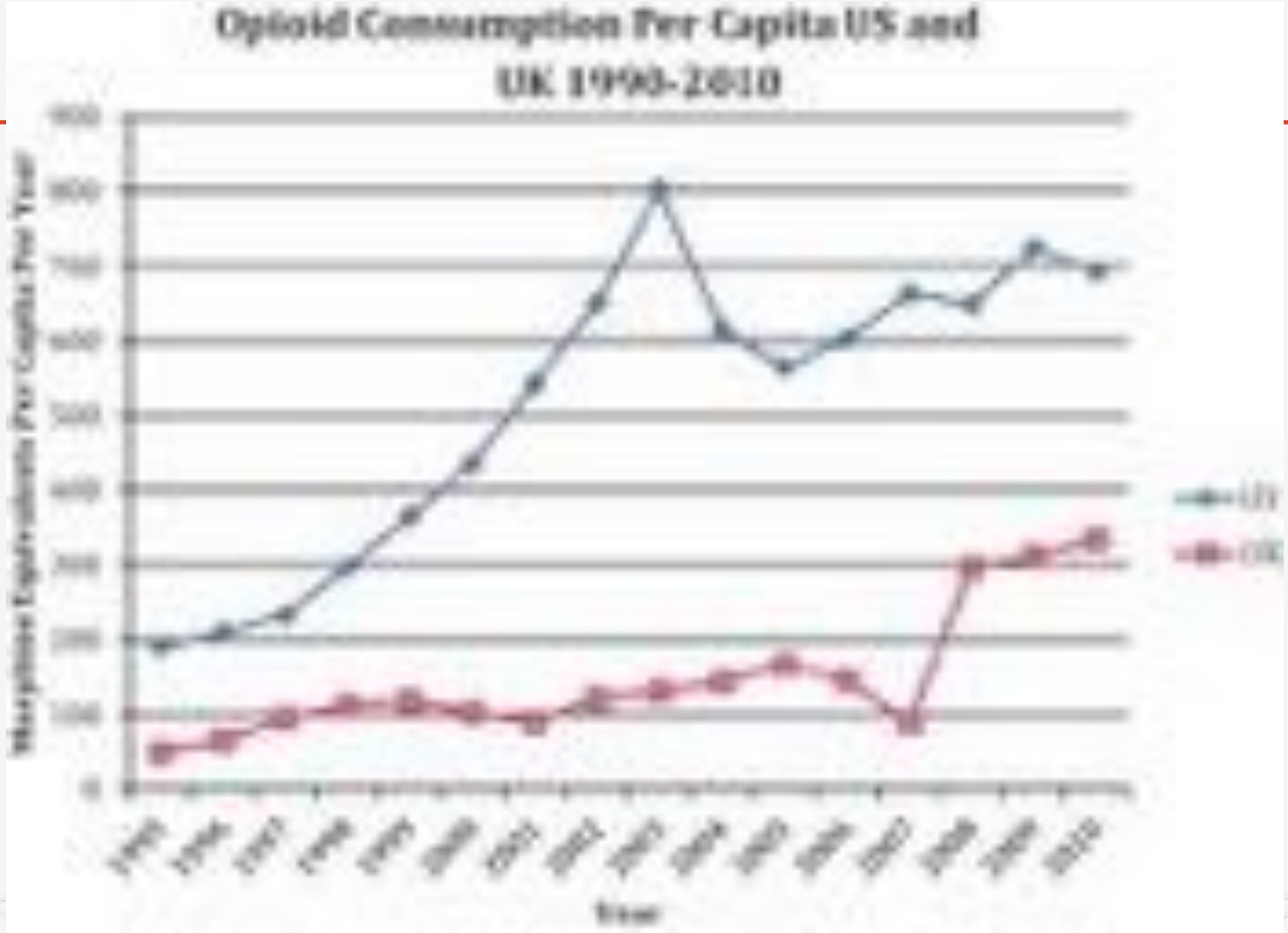
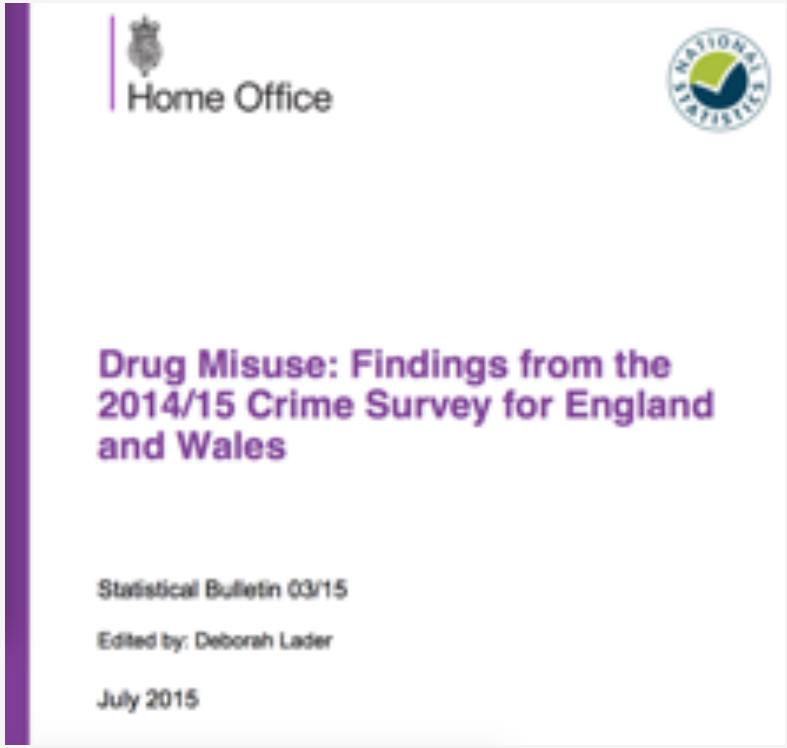

Opioid Consumption Per Capita US and UK 1990-2010
Year

Drug abuse

Opioid substitution therapy

Almost 2m Britons taking painkillers just to get high

- Overall, 5.4 % of adults aged 16 to 59 years had misused a prescription-only painkiller not prescribed to them
- More common in younger ages
  - 7.2 % of 16 to 24 year olds had misused a prescription-only painkiller in the last year, while 4.9 % of 25 to 59 year olds had done so
- Less likely to have used other drugs
  - 25% of the 16 to 59 year olds who had reported misuse of prescription-only painkillers reported having taken another drug in the last year
  - Whereas users of new psychoactive substances of whom more than 83% had used another illicit drug in the last year



Drug Misuse: Findings from the 2014/15 Crime Survey for England and Wales.

FACULTY OF PAIN MEDICINE of the Royal College of Anaesthetists

CSEW 2016-17

In the last year 7.6% of adults aged 16 to 59 years had taken a prescription-only painkiller not prescribed to them for medical reasons

Drug Misuse: Findings from the 2016/17 Crime Survey for England and Wales.

Patients on chronic opioid intake

Tolerance

Physical dependence

Withdrawal symptoms

Addictive behaviour

Opioid induced hyperalgesia(OIH)

Undertreated for pain

Physical dependency

Neuropharmacological phenomenon

Addiction

Neuropharmacological and behavioural phenomenon

Physical dependency

Neuropharmacological phenomenon

Neuroadaptation

Neuroplasticity

Manifested by drug specific withdrawal syndrome

Abrupt cessation

Rapid dose reduction

Decreasing blood levels and /or administration of and antagonist.

Opioid Withdrawal symptoms

Yawning	Sweating	Lacrimation
Rhinorrhoea	Anxiety	Restlessness
Insomnia	Dilated pupils	Piloerection
Chills	Tachycardia	Hypertension
Nausea and vomiting	Crampy abdominal pains	Diarrhoea
Muscle aches and pains		

Piloerection results in appearance of a plucked turkey - ‘Going cold turkey’

Can occur 4-6 hours after last dose of short acting opioid later for slow release preparations.

Addiction

Neuropharmacological and behavioural phenomenon

Influenced by genetic, psychosocial and environmental factors

Characterised by behaviour that includes one or more of

- Impaired control over drug use
- Compulsive use
- Continued use despite harm
- Drug craving

Pathophysiology of opioid dependence and tolerance

Neuroadaptations at multiple levels

Receptor level

Cellular adaptations

Synaptic plasticity

Systemic adaptations

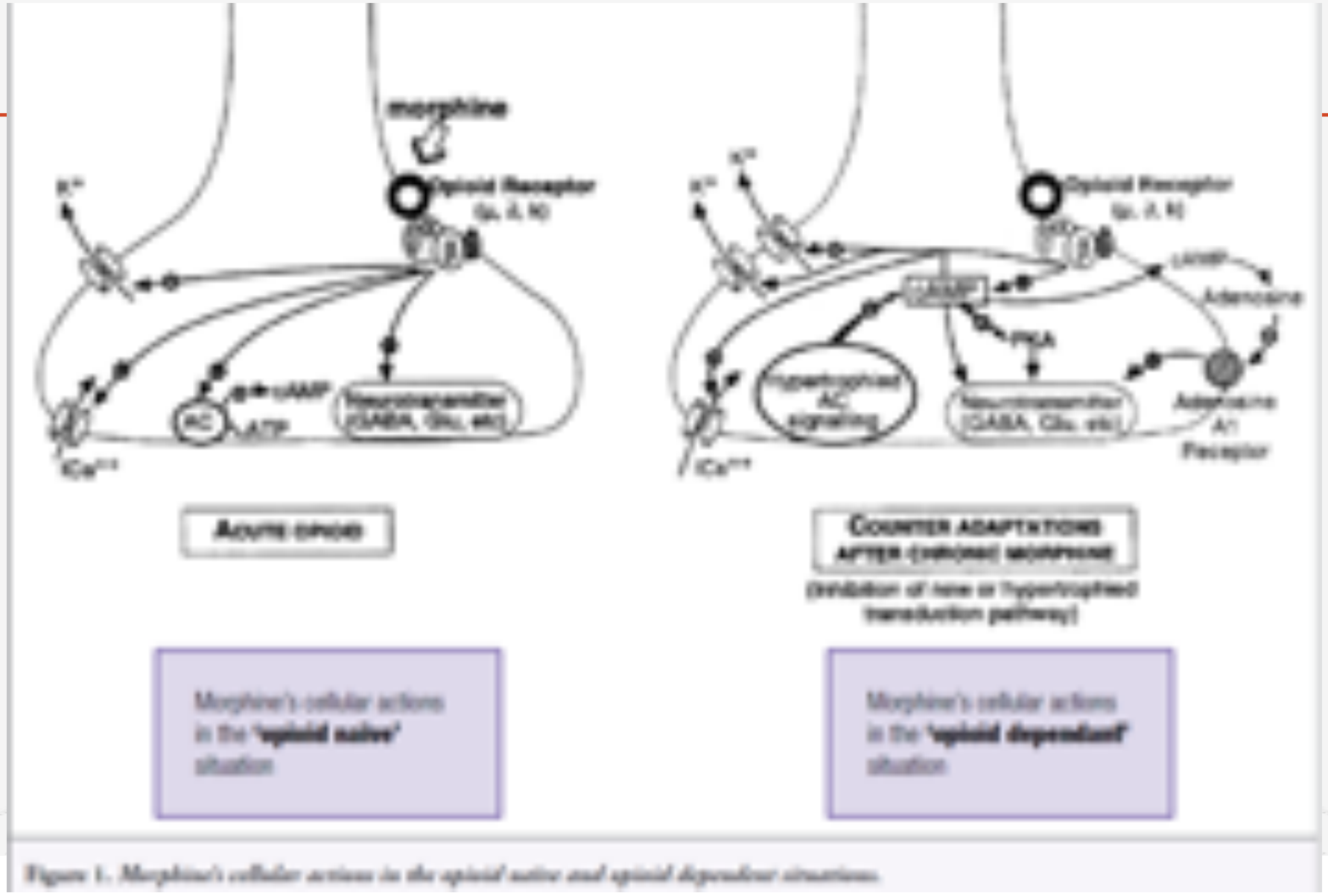


Figure 1. Morphine's cellular actions in the opioid naive and opioid dependent situations.

Synaptic plasticity

Synaptic learning and memory is influenced by chronic opioid exposure

This can be attributed to both long term potentiation and depression

Glutamate mediated changes including increased AMPA receptor mediated neurotransmission in synapses subsequently affecting the synaptic strength.

Systemic adaptations

In opioid sensitive neuronal and neuroglial networks

Change in electrical activity in a component of a neuronal network inducing adaptations in other neurons and synapses

For example:

mu opioid agonist on dopaminergic neurons may be responsible for symptoms in addiction.

Management

Adequate review and assessment

Provision of effective analgesia

Prevention of withdrawal from opioids

Involvement of Multidisciplinary teams

Treatment of comorbidities

Organisation of appropriate management on discharge

Pre-op

Multidisciplinary approach

- Acute pain team
- Palliative care

Daily opioid intake

Efficacy of analgesia be assessed

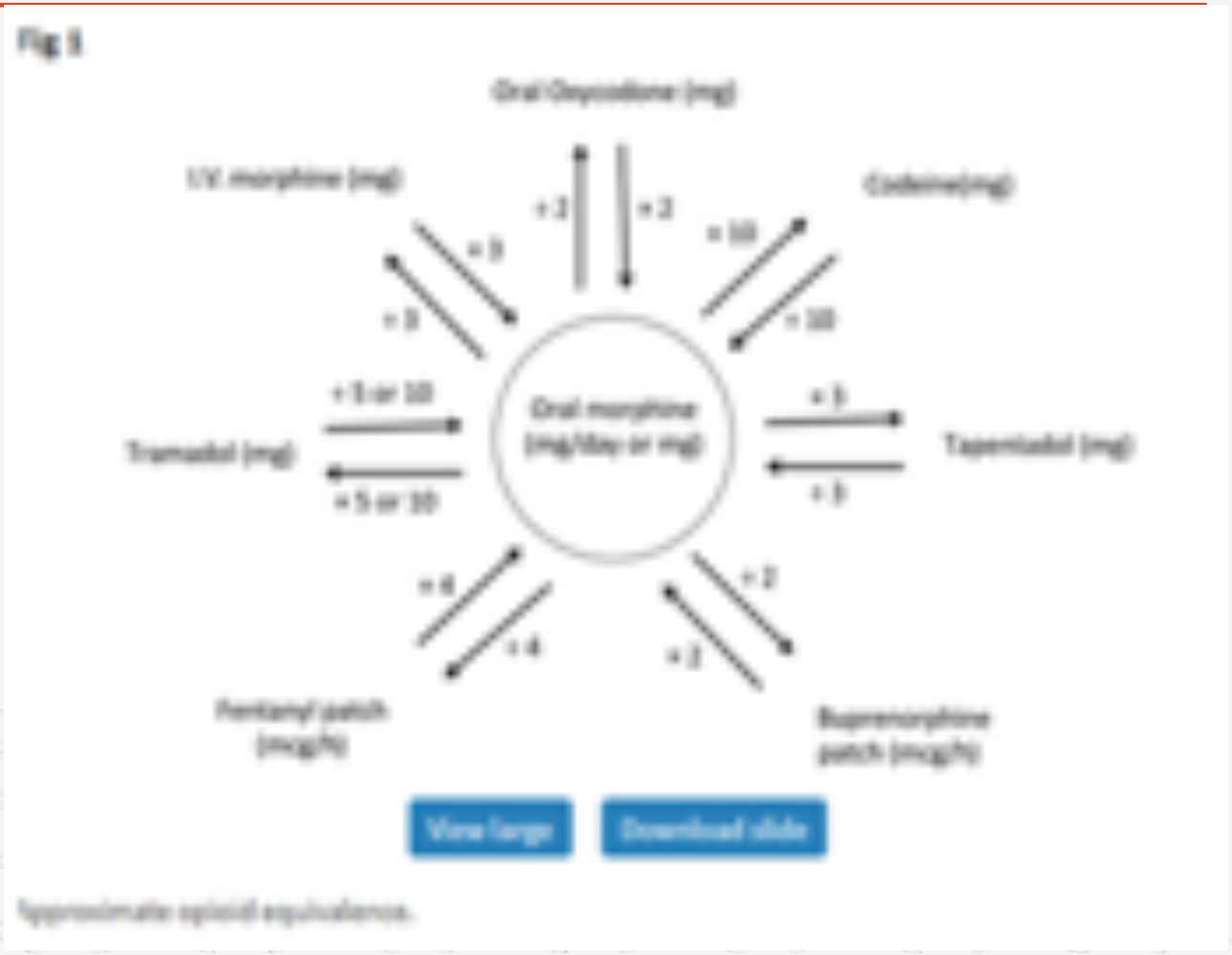
Any unrelieved pain treated if possible

Daily opioid intake

Route

Dose

Oral morphine Equivalent



Transdermal opioid patches

- Delayed opioid absorption
- Inflexible dose delivery

Long-term buprenorphine

- Maintenance therapy should be continued
- Short acting opioid analgesic titrated to achieve therapeutic effect

Intrathecal opioids - continue this mode

Table 3 Summary of factors affecting postoperative opioid requirements in patients with chronic/cancer pain on high doses of opioids preoperatively

Preoperative	• Unrelieved pain • Opioid drug, dose, route of delivery, immediate or modified release preparations, duration of administration
Intraoperative	• Type and location of surgery • Regional anaesthesia • Adjuvants and nerve blocks
Postoperative	• Pain score • Tolerance • Physical dependence • Level of sedation • Medical condition

Intraoperative and Postoperative period

Opioid-tolerant patients will need larger dose of opioid to achieve satisfactory pain relief.

Baseline opioid administration in the postoperative period in order to prevent a withdrawal reaction

The postoperative baseline opioid requirement is calculated from the preoperative opioid consumption

Continue with Neuropathic agents and Other non-opioid analgesia

Assess severity and duration of surgery: Have a discharge plan.

Short day surgery cases could continue with their regular opioid regime, taking their medications as planned and be discharged on a temporary increased dose of opioids with education of patient and information to GP to reduce this post operatively within a few days.

For longer operations/ disruption to enteral route, convert opioid requirements including topical to IV morphine equivalent and run this daily dose as IV morphine equivalent as a background infusion in addition to PCA e.g. 150 mg BD MST = 300 mg PO/24 hrs = 100mg IV/24 hrs. Therefore, background infusion of 4 mg/hr. Consider bolus of 1/2 hourly rate.

For buprenorphine patch up to 70 mcg continue (unlikely to interfere with full agonism of other opioid medications)

For methadone conversion, seek advice

Monitor: pain scores, level of sedation, tolerance

Utilise regional anaesthesia approaches whenever possible and not contra-indicated continue basal opioid requirements alongside this to avoid withdrawal

Use non-opioid adjuvant analgesia e.g. lidocaine, ketamine, clonidine

The effect of surgery may be to increase or decrease opioid requirements.

Increases of 20% or more above the baseline opioid requirement have been reported, depending on the surgical procedure.

In cancer patients, surgery may alleviate pain because of removal local effects of the tumour on local structures.

Surgery may change the nature of the pain, for example neuropathic pain may be reduced and nociceptive pain may increase

Multimodal approach

Regional anaesthesia Neuraxial blocks/Peripheral nerve blocks

NMDA receptor antagonists

Neuropathic agents

Paracetamol and NSAIDS

Clonidine

Lidocaine infusion

Treat other comorbidities like anxiety and depression

NMDA antagonists

NMDA receptor thought to be involved in the development of tolerance

Antagonistic

- Ketamine
- Magnesium

Reduce opioid requirement and improve pain relief

Anti-hyperalgesia properties

Ketamine 50-200mg/24hrs or infusion 0.1mg/kg/hr

Lidocaine infusion

Bolus dose 1-2mg/kg followed by infusion of 0.5-2mg/kg/hr

Anti-inflammatory, anti-hyperalgesia and gastrointestinal pro-peristaltic action

Good evidence for gastrointestinal surgeries- decreased pain scores,

opioid consumption and less side effects(Vigneault et al 2011)

Gabapentinoids

Antihyperalgesic properties (Schug, 2012)

Anxiolytic properties (Baldwin etal 2013)

PCA analgesia

Useful way especially if requirements are high

Patients unable to take oral medications/Continuous background infusion to cover the basal requirements

Adjustment of the size of the bolus on patient’s response

Once able to take oral doses usual regimens restarted to replace the background infusions

Higher PCA doses needs to be monitored continuously and medical staff well trained

Opioid rotation

Switching form one opioid to another

Common practice in palliative care settings

New opioid may be more effective and result in better side effect profile

Differing receptor activities and incomplete cross-tolerance

New opioid started at about 2/3rd of the calculated equianalgesic dose

Switching from long acting to intermittent doses of short acting may trigger withdrawal.

Opioid different from the patients' usual long term medication for the additional opioid requirement

Opioid substitution therapy

Methadone

- Long acting pure agonist
- Analgesic action is shorter
- Continue with additional opioids for management of acute pain

Buprenorphine

- Given sublingual or as patches
- Should be continued

Naltrexone

Pure opioid antagonistic

For treatment of alcohol and opioid addiction

Tablet or Implanted pellet

Difficult to achieve pain relief even with high doses of opioids

Stopped at least 24-48 hours before the surgery

Summary

Managing acute pain in opioid dependent patients is a challenge

Converting the total opioid dose to oral morphine equianalgesic dose gives a idea of total opioid dose

Continue with the basal opioid doses with short acting opioids to cover the additional requirement

Multimodal approach

Help of multidisciplinary teams


THANK YOU FOR LISTENING!
ANY QUESTIONS?

References

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