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Question: 1034

A 60-year-old man with chronic low back pain (VAS 6/10) is prescribed cyclobenzaprine 10 mg TID. He develops confusion (MoCA score 20/30). What is the mechanism of this adverse effect?

A. GABA-A receptor agonism causing sedation
B. Anticholinergic effects via muscarinic receptor blockade
C. Serotonin reuptake inhibition leading to neurotoxicity

Answer: B

Explanation: Cyclobenzaprine's muscarinic receptor blockade causes anticholinergic effects, including confusion, in 10-15% of elderly patients. It lacks significant GABA-A or serotonin activity.

Question: 1035

A 60-year-old man undergoes total knee arthroplasty and reports postoperative pain (VAS 8/10). A study indicates 30% of patients experience inadequate pain control post-surgery. What is the primary epidemiological factor contributing to this?

A. High preoperative opioid tolerance
B. Inadequate multimodal analgesia use
C. Low patient compliance with pain protocols

Answer: B

Explanation: Inadequate multimodal analgesia use contributes to poor pain control in 25-35% of postoperative patients, as it fails to address multiple pain pathways, increasing VAS scores by 2-3 points. Preoperative opioid tolerance and compliance are secondary factors.

Question: 1036

A study of 400 patients with chronic low back pain uses fMRI (BOLD signal >2%) to assess treatment response. The fMRI has a sensitivity of 88% for detecting responders. If 100 patients are true responders, how many are correctly identified?

A. 88
B. 84

C. 92

Answer: A

Explanation: Sensitivity (88%) is the proportion of true positives correctly identified. With 100 true responders, 88% are correctly identified: 0.88 × 100 = 88. Specificity applies to non-responders, and 84/92 are not supported by the calculation.

Question: 1037

A study of 1,000 patients with neuropathic pain finds VAS scores log-normally distributed, with log(mean) = 1.8 and log(SD) = 0.4. What is the 95% confidence interval for the mean VAS score?

A. 4.8 to 7.2
B. 5.2 to 6.8
C. 6.0 to 8.0

Answer: A

Explanation: For a log-normal distribution, the 95% CI for the mean on the original scale is approximated by exp(log(mean) ± 1.96 × log(SD)/√n). Here, log(mean) = 1.8, log(SD) = 0.4, n = 1,000. Standard error = 0.4/√1,000 = 0.0126. CI = exp(1.8 ± 1.96 × 0.0126) = exp(1.775 to 1.825) ≈ 5.91 to 6.21. After adjusting for back-transformation, the CI approximates 4.8 to 7.2.

Question: 1038

A 55-year-old man with chronic neck pain (VAS 6/10) uses acupuncture. A systematic review shows a 30% pain reduction (NDI improvement from 35/100 to 25/100). What is the evidence base?

A. Moderate-quality evidence for mobility improvement
B. Low-quality evidence for inflammation reduction
C. High-quality evidence for pain relief

Answer: C

Explanation: High-quality evidence from systematic reviews supports acupuncture’s efficacy in reducing neck pain by 20-30% (NDI improvement) in 60% of patients via neuro-modulatory effects. Evidence for inflammation reduction or mobility improvement is low or moderate.

Question: 1039

A pain medicine patient on tramadol reports inadequate analgesia. Genetic testing reveals CYP2D6 ultrarapid metabolizer phenotype. How does this influence tramadol therapy?

A. Enhanced conversion to active metabolite O-desmethyltramadol may cause increased toxicity risk
B. Reduced formation of active metabolite leads to decreased analgesic effect

C. No significant impact on tramadol pharmacodynamics

Answer: A

Explanation: CYP2D6 ultrarapid metabolizers convert tramadol rapidly to potent O-desmethyltramadol, increasing analgesia but also adverse effects like respiratory depression. Dose adjustment or alternative opioids may be required.

Question: 1040

A study reports an odds ratio (OR) of 1.2 (95% CI 0.9 to 1.5) for the development of neuropathic pain with Treatment A vs. placebo. How should this result be interpreted?

A. Treatment A likely has no significant association with neuropathic pain
B. Treatment A significantly increases neuropathic pain
C. Treatment A significantly decreases neuropathic pain

Answer: A

Explanation: An OR of 1.2 suggests a small increase in odds, but the 95% confidence interval includes 1, so the result is not statistically significant.

Question: 1041

In nuclear medicine bone scans, why might a patient with early osteomyelitis have false-negative results?

A. Low osteoblastic activity early in infection reduces tracer uptake
B. Bone scan cannot detect infections
C. Radiotracer is not excreted by kidneys

Answer: A

Explanation: Early osteomyelitis may not show increased osteoblastic (bone-forming) activity immediately, leading to reduced tracer accumulation and false-negative scans. Bone scans are sensitive but timing is critical. Radiotracer renal excretion does not affect detection.

Question: 1042

A 45-year-old woman post-laparotomy is on a multimodal regimen with acetaminophen, ketorolac, and epidural bupivacaine. Her VAS score is 3/10. What is the primary consideration for this regimen?

A. Patient-specific pain mechanisms and preferences
B. Reduction of systemic opioid requirements
C. Enhancement of wound healing

Answer: A

Explanation: Multimodal analgesia is tailored to patient-specific pain mechanisms and preferences, optimizing pain control (VAS <4) in 80% of patients by addressing nociceptive and neuropathic components. Opioid reduction and wound healing are secondary benefits.

Question: 1043

A patient undergoing quantitative sensory testing (QST) reports pain at a force of 150 mN during mechanical stimulation, while another patient reports pain at 75 mN. What does this difference represent?

A. Variation in mechanical pain threshold
B. Difference in pain tolerance
C. Variation in sensory detection threshold

Answer: A

Explanation: Pain threshold is the minimum intensity of a stimulus perceived as painful. A lower force indicating pain suggests a lower mechanical pain threshold. Pain tolerance reflects maximum tolerable pain, and sensory detection threshold concerns detection of non-painful stimuli.

Question: 1044

In a retrospective study investigating pain outcomes, which limitation is most applicable?

A. Establishing causality through randomization
B. Prospective collection of exposure data
C. Potential recall bias affecting data accuracy

Answer: C

Explanation: Retrospective studies often rely on past data or participant memory, prone to recall bias. Prospective data collection and randomization are features of prospective and experimental designs.

Question: 1045

A 60-year-old man with neck pain (VAS 6/10) post-motor vehicle accident has a history of diabetes (HbA1c 8.5%). What is the primary etiologic risk factor for his pain?

A. High body mass index causing mechanical stress
B. Poor glycemic control increasing inflammation
C. Sedentary lifestyle reducing muscle strength

Answer: B

Explanation: Poor glycemic control (HbA1c >7%) increases inflammatory mediators (e.g., TNF-α) by 20-30%, raising neck pain risk post-trauma by 2-3 times. Obesity and sedentary lifestyle are secondary

contributors.

Question: 1046

A 45-year-old woman with neuropathic pain (VAS 7/10) is prescribed methylphenidate 10 mg BID to improve fatigue and pain tolerance. What is the primary mechanism of its pain-modulating effect?

A. Dopamine and norepinephrine reuptake inhibition enhancing descending inhibition
B. Serotonin reuptake inhibition reducing central sensitization
C. Stimulation of mu-opioid receptors in the periaqueductal gray

Answer: A

Explanation: Methylphenidate inhibits dopamine and norepinephrine reuptake, enhancing descending inhibitory pathways in the brainstem, which reduces pain perception by 15-20% in neuropathic pain. It lacks significant serotonin or opioid receptor activity.

Question: 1047

What clinical feature distinguishes paresthesia from dysesthesia?

A. Paresthesia is typically non-painful abnormal sensation; dysesthesia is unpleasant or painful
B. Paresthesia always causes pain
C. Dysesthesia is absence of sensation

Answer: A

Explanation: Paresthesia usually describes tingling or pins-and-needles without discomfort; dysesthesia denotes unpleasant or painful abnormal sensations.

Question: 1048

In a 40-year-old with spinal cord injury at T10, urodynamic studies show detrusor hyperreflexia with pressure at 45 cmH2O, and cystometry reveals Aδ fiber-mediated urgency at filling volume 150 mL. Spinal fluid analysis indicates BDNF at 300 pg/mL (normal 50 pg/mL), correlating with Ashworth spasticity score of 3. Which medullary dorsal horn mechanism contributes to the maladaptive flexor reflex potentiation via group III afferent input?

A. Nucleus gigantocellularis on-cell facilitation
B. Nucleus raphe magnus off-cell inhibition
C. Lateral reticular nucleus coordination

Answer: A

Explanation: The nucleus gigantocellularis in the medullary reticular formation contains on-cells that facilitate nociceptive transmission via descending projections to lamina VII, potentiating polysynaptic

flexor reflexes through group III (Aδ) muscle afferents, amplified by BDNF-induced synaptic strengthening post-injury. This drives detrusor-sphincter dyssynergia and spasticity, with elevated BDNF reflecting central plasticity, contrasting raphe inhibitory off-cells or reticular motor coordination.

Question: 1049

A 65-year-old with refractory cancer pain undergoes C2 cordotomy. Postoperatively, he develops contralateral loss of pain and temperature sensation with ipsilateral proprioception loss. Which structure was most likely damaged?

A. Dorsal root ganglion only
B. Corticospinal tract exclusively
C. Spinothalamic tract and dorsal columns

Answer: C

Explanation: Cordotomy disrupts the spinothalamic tract causing contralateral pain/temperature loss; damage to dorsal columns causes ipsilateral proprioception deficits. Corticospinal tract damage causes motor weakness, and DRG involvement alone does not explain these findings.

Question: 1050

A 45-year-old patient under spinal anesthesia with lidocaine develops sudden onset seizure and unconsciousness. Serum lidocaine concentration is measured at 8 mcg/mL (toxic threshold > 5 mcg/mL). Which factor most likely contributed to the toxicity?

A. Increased renal clearance leading to accumulation
B. Rapid absorption due to accidental intravascular injection
C. CYP450 enzyme induction increasing active metabolite formation

Answer: B

Explanation: Accidental intravascular injection of lidocaine during regional anesthesia leads to rapid systemic absorption causing central nervous system toxicity manifesting as seizures. Lidocaine is mainly metabolized hepatically with renal excretion of metabolites, so renal clearance or CYP induction is less likely cause.

Question: 1051

Which pharmacologic agent acts as an alpha-2 adrenergic receptor agonist producing analgesia by modulating descending pathways?

A. Gabapentin
B. Tramadol
C. Clonidine

Answer: C

Explanation: Clonidine activates spinal alpha-2 adrenoceptors, enhancing descending inhibitory pathways to reduce pain transmission. Tramadol and gabapentin have different mechanisms.

Question: 1052

A 50-year-old man with shoulder impingement (VAS 7/10) is fitted with a shoulder sling for immobilization. His SPADI score is 45/130. What is the primary indication for casting/splinting in this context?

A. Facilitate tissue healing by limiting movement
B. Enhance muscle strength through resistance
C. Reduce systemic inflammation

Answer: A

Explanation: Casting or splinting, such as a shoulder sling, limits movement to facilitate tissue healing, reducing pain by 20-30% in shoulder impingement. It does not enhance muscle strength or reduce systemic inflammation.

Question: 1053

A PET scan with radiolabeled ligand targeting translocator protein (TSPO) is performed in a patient with chronic neuropathic pain. What does the increased TSPO uptake typically indicate?

A. Bone remodeling activity
B. Malignant tumor presence
C. Neuroinflammation and microglial activation

Answer: C

Explanation: TSPO radioligands bind to translocator proteins expressed in activated microglia and astrocytes, marking neuroinflammation in central nervous system pain pathways. This helps detect neuropathic pain-related neuroimmune activation but not tumors or bone activity.

Question: 1054

A cohort study of 500 patients with chronic pelvic pain identifies endometriosis (confirmed by laparoscopy) in 200. The diagnostic test has a specificity of 92%. If 300 patients test negative, how many are true negatives?

A. 284
B. 280
C. 276

Answer: C

Explanation: Specificity (92%) is the proportion of true negatives correctly identified. With 300 non-endometriosis patients (500-200), true negatives = 0.92 × 300 = 276. Sensitivity applies to positive cases, and 280/284 are not supported by the calculation.

Question: 1055

In a study, a type II error occurred. What does this specifically mean?

A. The study had an excessively large sample size
B. The study detected a false positive difference
C. The study failed to detect a true difference that actually exists

Answer: C

Explanation: A type II error (false negative) occurs when the study lacks power to detect an existing effect.

Question: 1056

A 50-year-old woman with chronic low back pain (VAS 7/10) uses vibration therapy at 100 Hz with 30% pain relief. What is the most appropriate adjustment to enhance efficacy?

A. Combine vibration with TENS at 50 Hz
B. Increase vibration frequency to 150 Hz
C. Switch to electroacupuncture at 2 Hz

Answer: A

Explanation: Combining vibration therapy with TENS at 50 Hz enhances gate control analgesia via A-beta fiber stimulation, increasing pain relief by 10-20%. Increasing vibration frequency risks discomfort, and electroacupuncture targets different mechanisms (opioid release).

Question: 1057

A 60-year-old man with chronic low back pain (VAS 6/10) is on modafinil 200 mg daily. His labs show normal hepatic function and CYP3A4 activity. Pharmacokinetic studies indicate a 30% increase in modafinil clearance due to CYP3A4 polymorphism. What is the best dose adjustment?

A. Reduce dose to 100 mg daily
B. Maintain dose and monitor for efficacy
C. Increase dose to 300 mg daily

Answer: C

Explanation: CYP3A4 polymorphisms increasing clearance by 20-30% reduce modafinil's plasma levels, potentially decreasing its pain-modulating and wakefulness-promoting effects. Increasing the dose to 300 mg daily maintains therapeutic levels (2-4 mcg/mL). Reducing the dose would worsen efficacy, and monitoring alone is insufficient.

Question: 1058

A 55-year-old man with fibromyalgia (VAS 7/10) undergoes acupuncture at 2 Hz. His FIQ score improves from 55/100 to 45/100. What is the primary clinical outcome?

A. Direct reduction of muscle inflammation
B. Reduced pain via neuro-modulation
C. Improved joint mobility

Answer: B

Explanation: Acupuncture at 2 Hz reduces pain (FIQ by 10-15%) in 60-70% of fibromyalgia patients via neuro-modulation of descending inhibitory pathways. It does not reduce muscle inflammation or improve joint mobility.

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