Neurological Examination

Adam Zeman

Professor of Cognitive and Behavioural Neurology
University of Exeter Medical School
Neurological examination

• History rules!
Neurological examination

- History rules!
  - and you are very good at it
Neurological examination

• History rules!
  – and you are very good at it

• History yields hypotheses
Neurological examination

• History rules!
  – and you are very good at it

• History yields hypotheses
  – Where?
Neurological examination

• History rules!
  – and you are very good at it

• History yields hypotheses
  – Where?
  – What?
Neurological history taking

• Diagnostic hypothesis – where, then what?

  – Where?
    • Muscle
    • NMJ
    • Peripheral nerve
    • Spinal cord
    • Brain
      – Brain stem
      – Cerebellum
      – Thalamus
      – basal ganglia
      – Lobe or network
Neurological history taking

Some common symptom patterns:

- **NMJ**
  - Fatiguable weakness

- **LMN**
  - Distal weakness and numbness
  - Dysarthria, dysphagia

- **UMN**
  - Dexterity, dragging foot, exertional worsening, clonus, spasms and sphincter disturbance

- **Extrapyramidal**
  - Aching, slowing up, shuffling, dexterity, handwriting

- **Cerebellar**
  - Slurring of speech, clumsiness, unsteadiness
Neurological history taking

- Diagnostic hypothesis – where, then what?
  - What?

  eg spinal cord syndrome:
  - Compression
    - Disc
    - tumour
  - Demyelination
  - Stroke…
Neurological history taking

• ‘Whats’
  – Inherited vs acquired
  – Vascular
  – Inflammatory
  – Neoplastic
  – Traumatic
  – Allergic
  – Metabolic
  – Endocrine
  – Drugs
  – Iatrogenic
  – Psychiatric
  – Mechanical/Structural
  – Degenerative
  – Deficiency
  – Sleep-related
  – Physiological
Neurological examination

- Examination tests the hypotheses framed from the history
- It rarely surprises
- So why do it?
Neurological examination

• It’s expected
Neurological examination

• It’s expected
• Helps to build a relationship
Neurological examination

• It’s expected
• Helps to build a relationship
• Allows some more history taking
Neurological examination

- It’s expected
- Helps to build a relationship
- Allows some more history taking
- Buys time for thought
Neurological examination

- It’s expected
- Helps to build a relationship
- Allows some more history taking
- Buys time for thought
- Allows you to recognise ‘normal’
Neurological examination

- It’s expected
- Helps to build a relationship
- Allows some more history taking
- Buys time for thought
- Allows you to recognise ‘normal’
- May provide confirmatory signs
Neurological examination

- It’s expected
- Helps to build a relationship
- Allows some more history taking
- Buys time for thought
- Allows you to recognise ‘normal’
- May provide confirmatory signs
- Occasionally springs a surprise
Neurological examination

- It’s expected
- Helps to build a relationship
- Allows some more history taking
- Buys time for thought
- Allows you to recognise ‘normal’
- May provide confirmatory signs
- Occasionally springs a surprise
- Therapeutic ritual
Neurological examination

• Neurologists have two advantages –
Neurological examination

- Neurologists have two advantages –
  - Calibration by many normal examinations
Neurological examination

• Neurologists have two advantages –
  – Calibration by many normal examinations
  – Knowledge of neurological disorders:
Neurological examination

- Neurologists have two advantages –
  - Calibration by many normal examinations
  - Knowledge of neurological disorders:
    ‘the eye will not see what the mind does not know’
Neurological examination

• Focus on aspects that are
  – Most robust
Neurological examination

• Focus on aspects that are
  – Most robust
  – Most revealing – especially in neuropsychiatry
Useful patterns of signs

• Neuromuscular junction
  – fatiguable weakness (eg ptosis)
Useful patterns of signs

- Neuromuscular junction
  - fatiguable weakness (e.g., ptosis)

- Lower motor neuron
  - Wasting, fasciculation
  - Decreased tone
  - Weakness
  - Reduced or absent reflexes
  - +/- accompanying sensory loss, often distal
Useful patterns of signs

• Upper motor neuron
  – Spastic posture
  – Clasp-knife increase in tone
  – ‘Pyramidal pattern’ of weakness
  – Excessively brisk reflexes
  – Extensor plantars
  – +/- accompanying sensory loss
    • sensory level
    • hemisensory loss
Useful patterns of signs

• Extrapyramidal (pathology in basal ganglia)
  – Reduced spontaneous movement if akinetic rigid syndrome (eg Parkinson’s)
  – Chorea if hyperkinetic (eg Huntington’s)
  – Rigid increase in tone if akinetic
  – Power near normal once mobilised
  – Reflexes normal
  – Decrementing bradykinesia in Parkinson’s disease
Cortico-striatal loops
Interrelationship of thalamus, lentiform nucleus, caudate nucleus and amygdaloid body (schema): left lateral view
Useful patterns of signs

• Cerebellar
  – DANISH
    • Dysdiadochokinesia
    • Ataxic gait
    • Nystagmus
    • Intention tremor
    • Slurred speech
    • Hypotonia
Useful patterns of signs

- Functional weakness (‘hysterical’)
  - Hoover’s sign (voluntary hip extension weak, automatic hip extension on flexion of opposite leg normal)
- Fluctuating or ‘collapsing’ weakness
- ‘acrobatic’ gait
Neurological examination

- Informal observation
  - Muscle bulk
  - Posture
    - Spastic
    - Dystonic
  - Involuntary movements
    - Tics, choreoathetosis, tremor, myoclonus
  - Paucity of movement
**Neurological examination**

- Informal observation
  - Gait
    - Stiff
    - Ataxic
    - Bradykinetic
    - Lurching
Neurological examination

- Gait
  - Ordinary
  - Heel-toe
  - Romberg’s
  - Heel, toe walking
  - Rise from squat
  - Hopping on one leg at a time
Neurological examination

- I
  - eg head injury

- II
  - Acuity
  - Fields
  - Fundi…postpone
  - eg optic neuropathy
  - eg tumour

- III, IV, VI
  - eg PSP, MS
  - Pursuit
  - Saccadic
  - Convergence
  - eg papilloedema, atrophy
  - ...Fundi
  - ...pupillary responses
  - eg Syphilis
Neurological examination

- V
  - Motor
  - Sensory
- VII
- VIII
- IX/X
- XI
- XII
Neurological examination

• Limbs
  – Observation
  – Tone
  – Power
  – Reflexes
  – Sensation
    • Temperature or pin-prick
    • Vibration or joint position
  – Coordination

…hunting for the patterns…. 
Neurological examination

• History rules
• Yields hypotheses –
  – Where?
  – What?
• Examination tests these
• Much of this is informal
• LMN, UMN, cerebellar, extrapyramidal patterns are (relatively) robust
• Some signs are especially revealing
• Calibration and knowledge are keys
Neurological examination

• ps
  – Ask your neurologist to perform a mental state examination 😊
Neurological examination

• An example