The Neurologic Exam
A Brief Manual

Avoiding Mistakes
(With Accompanying Essential Video Courses at HHHUniversity.com)

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About This Book

This book is the re-presentation of a course given to medical students, junior doctors, candidates for the FRACP, over the last twenty years at hospitals in Sydney, Australia.

In spite of the many fine Neurologic Examination books available, these young doctors were often left wanting for more. They sensed that Neurology was "different". This small manual tries to fill that void.

The Manual, and its accompanying Essential Video courses (at hhhuniversity.com) has a main purpose. It is written in a telegrammatic manner. It goes from Symptom to Diagnosis to Treatment and beyond—via the shortest route, aiming for the least errors. Looking at things from the perspective of avoiding mistakes or knocking off the "rough edges" of your thinking and examination is the aim. Nothing in it is new or profound. I am beholden to countless texts and teachers over many years who gave so generously of their time and their passion.

The book has been purposely kept small so you can carry it around with you during your lectures, training, ward rounds, reading.

There are many empty pages for you to add what you learn from all your daily travels: what You think is important. The book is by no means complete and there are many things that you will NOT find here. It aims to impart the basic exam and history clearly, concisely and completely.

Mistakes cost everyone time, money, inconvenience. The Manual aims to make you thoughtful about what you learn for your career ahead.

Because *No one ever read a book on how to ride a bicycle before riding a bicycle,* the Videos are THE teaching tools in this course—the words carry accumulated wisdom. Your patient is your only Complete Teacher.

Some of the Manual is for absolute beginners; other sections for the more advanced and some for the most advanced Neurology Trainees.

With a little imagination, the methods shown in this little Manual can easily be translated to all other sub-sections of the Medical Examinations.

The Manual and Videos will be updated regularly in several languages.

The Neurologic Exam encompasses both the Historical and the Physical Exams. The Manual initially undertakes the Physical Exam as it: a) Seamlessly connects to your High School memories of Physics and Arithmetic; b) Involves your physical participation; c) Must be done during daylight hours. The Historical Exam takes far longer to master: reading on it can be done well into the night. Once engaged and unafraid, the rest of the subject should be more enjoyable and much easier to learn.

Neuro Exam and Localisation—Let's Dispel Some Myths First

Why do you find the Neuro Exam difficult?

Firstly; In all other physical exams you use your *eyes to Observe; fingers to Palpate and Percuss; ears to Auscultate and Percuss*—Presto!—Diagnosis. In Neurology, you will also use all the senses plus your *cognitive skills* to elicit the response appropriately and then interpret it . You will develop your skills beyond your senses alone. *It is the need for accuracy in these developed skills that takes time and patience*.

Secondly; students can learn the Respiratory Exam in one long weekend—while the Neuro System Exam has at least *15 "separate"* examinations! The Key: *All these exams follow a set Routine!*

Thirdly; the language used in Neurology is often confusing: formulated at different times and different continents; translated from other languages of original research; many technological developments thrown at it—so many books giving so many differing *"definitions"* of terms adds to confusion.

Fourthly; books and teachers do students a disservice by *"over-simplifying"* concepts so much that an intelligent student is left unsatisfied.

Fifthly; I would make the argument that the term should be changed from Neuro Exam to Neuro Measurement—reflecting the Scientific aspect to it. Once you view it as a measurement, you will aspire to do it justice every time.

Physical Examination (Measurement)

What does a good Physical Exam depend upon?

The answer is surprisingly simple: the ease of the Neurologic physical exam starts and ends entirely with *your approach!*

You will need to learn the exam properly the first time; practise it—properly—all the time. The majority of the Neuro Exam—measuring Tone, Power, Reflexes, Sensation and Gait—can be mastered within weeks. *With Application*.

The Essential Video Courses will help guide you. Just as no two people walk alike, you will develop your own style. *The mastery of the Exam is entirely up to you.*

The Keys to *any* Good Physical Exam

The key to a Physical Exam is to ask: *Why am I* doing this exam—diagnosis, management or prognosis? Ask yourself this question every time and it will soon become second nature to you.

The Exam *Measures, Confirms* and *Documents* the *Signs and their Severity at that time.* Correct Documentation is *very* important. You may come back to see the patient in the middle of the night or post-operatively or after a treatment trial or after another team has been looking after him for some time: how will you remember what you had found previously and be able to compare it with what you find now—by accurately *recording* your findings every time.

The reason to examine (measure) *accurately* is that you want to compare side-to-side for a measurable difference; compare to other people of same gender and age; compare to what he may become tonight, tomorrow, and in a month's time as he recovers. Also: that you can hand over to another doctor signs in which you are confident.

How good *can* your measured examination be? One measure of outcomes of Physical Exams is the *Intra-Observer* and *Inter-Observer Variability*—how well do your own findings compare with your findings at another time and how well do your findings compare with others examining the same patient?

Starting with that in mind, each part of the Exam becomes a scientific exercise in Measurement. The Initial Hypothesis is generated from the Presenting Symptoms and the Initial Survey. The sequential parts of the exam then are carried out to Confirm and Document signs and their severity using: your brain to activate and measure: the effectors—your reflex hammer, tuning fork, ophthalmoscope, pin: your arms' and your body's positions in reference to the patients' head, limbs and body position. Aim for the *best reproducible measurements.*

The order of the Neuro Exam is completely Fixed and Invariable—like any scientific experiment. The simple rules are: *a) Do the least painful thing first, the most painful last; b) Economically: do the highest-yield parts first, lowest yield last; c) Do the independent variable first—the later, dependent variable obviously relies on it (like Visual Acuity before Extra-Ocular Movements); d) Irreversible parts should be done last; should be done most carefully and completely as you will not get a chance to return to it.*

Applying the above Principles to Muscle Exam we get: a) Inspection; b) Palpation and Passive Movement for Tone; c) Power; d) Deep Tendon Reflexes; e) Sensation; f) Co-ordination; g) Gait.

Applying the Principles to Eye Examination we get: a) Inspection; b) Acuity; c) Fields to Confrontation; d) Extra-Ocular Movements; e) Reflexes—Pupillary, Accommodation; f) Funduscopy.

The Essential Video Courses show the order for the Exams and give examples of how to proceed logically.

Your Physical Exam must also take into account *the Environment*—there are at least two persons in the measurement. There may be more: an anxious relative; other students; nurses; policeman, Interpreter—your exam-measuring will take them into account. Your explanation of what you would like the patient to do will vary according to all the preceding as well as adapting to the pain, psychologic distress, hearing, seeing, and language difficulties.

S*ubtle* Neurologic symptoms call for *closer attention and specific techniques*. Examination can be slowed or sped up; with slight effort or great effort, stressing the Nervous system to the point where the sign is demonstrable.

A "**New" Neurologic Model: your Guide-Maps to Neurology**

Patients do not come to you with a diagnosis: they come with a history, signs, test results. Your job is to figure out where the involvement has occurred in the Nervous System. Recall that the Nervous System is attuned to ***Survival—*** from its apex, the Cortex, to its termination, the bones. *"Survival",* in Neurology has a specific meaning: of: self; spouse; loved one; the pet; garden; finances; work; hobby; psychologic balance—what the Pt believes is the most important thing that must "survive" for *him* to be happy. Knowing this can be enormously helpful to you in your work with the patient and family.

A "new" Model of the Nervous System can be viewed as a building: going up and down elevators to different *"floors"* then travelling along its corridors for more accurate discovery.

There are many advantages to this Model:

1. You will never be without the Model—every *patient* is your Model,
2. Listening to the Presenting Symptoms, you assign them to a *floor*,
3. Eliciting a sign, you assign it to a *floor* or a *corridor*,
4. Putting the symptoms and signs together, you are thinking of what conditions affect that floor or corridor,
5. That floor or corridor's *specific* pathology test, *e.g., lumbar puncture*,
6. Specific therapies available at a floor and corridor, e.g. intrathecal,
7. Finally, you can present your short case findings, logically, from the top of the Model, to the location where you have found the pathological signs, to the investigation and possible treatments at that level and site.

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As you look at the Model on the next page, it seamlessly connects your patient's story from Symptom to final disposition. The various columns allow you to focus your thoughts—either during or after the Exam. The second column captures the symptoms that may be related to that Floor: the third, the signs (possibly unique) that may be generated from that Floor. Knowing these two aspects of a disorder is usually sufficient to allow Localisation. The fourth allows for the most likely (or unique) pathologies at that Floor: the fifth guides you to the best Tests available to interrogate that Floor: the sixth guides you to possible therapies. Estimating the extent of lesions at each level is also very important. *Syndromes* or "signs and symptoms that run together" will also aid your localisation skills. The box can be broken up into smaller units, e.g., meninges, vessels of cortex, and so one,,.,as you gain experience and confidence.

The Model may look like a lot to learn, however, introducing yourself to someone with a hand-shake, you have "screened" the whole nervous system for that upper limb! If a Pt admits themselves to hospital, you can surmise that a lot of the nervous system is working. Every time you talk to someone you are doing a Neuro Exam.

Each column in the Building below can be expanded into as many sub-fields as you feel you can handle to incorporate the tissues– such as blood vessel, histologic, staining, imaging, genetic characteristics: to incorporate the different pathologies and so forth.

A Model for Considering the Nervous System

Anatomical Classification	***Symptom of Each***	***Signs of Each***	***Expected Pathology***	***Ideal Investigation***	***Therapies possible***
1Cortex-SubC	1C-SubC	1C-SubC	1C-SubC	1C-SubC	1C-SubC
2Vent-Subarach	2V-SubAS	2V-SubAS	2V-SubAS	2V-SubAS	2V-SubAS
3Thal-Diencep	3Thal-Din	3Thal-Din	3Thal-Din	3Thal-Din	3Thal-Din
4Basal Ganglia	4BasGang	4BasGang	4BasGang	4BasGang	4BasGang
5Frontal Lobe	5F Lobe	5F Lobe	5F Lobe	5F Lobe	5F Lobe
6Occipital Lobe	6Occ Lobe	6Occ Lobe	6Occ Lobe	6Occ Lobe	6Occ Lobe
7Temp Lobe	7T Lobe	7T Lobe	7T Lobe	7T Lobe	7T Lobe
8Parietal Lobe	8Par Lobe	8Par Lobe	8Par Lobe	8Par Lobe	8Par Lobe
9Midbrain	9Midbrain	9Midbrain	9Midbrain	9Midbrain	9Midbrain
10Pons	10Pons	10Pons	10Pons	10Pons	10Pons
11Medulla	11Medulla	11Medulla	11Medulla	11Medulla	11Medulla
12Cranial Nerve	12CNerves	12CNerves	12CNerves	12CNerves	12CNerves
13Cerebellum	13Cerebell	13Cerebell	13Cerebell	13Cerebell	13Cerebell
14Spinal Cord	14S Cord	14S Cord	14S Cord	14S Cord	14S Cord
15SpinlRootlets	*15Rootlets*	*15Rootlets*	*15Rootlets*	*15Rootlets*	*15Rootlets*
16Spinal Roots	*16SpRoots*	*16SpRoots*	*16SpRoots*	*16SpRoots*	*16SpRoots*
17B/L Plexus	*17B/LPlex*	*17B/LPlex*	*17B/LPlex*	*17B/LPlex*	*17B/LPlex*
18Periph Nerve	*18PNerves*	*18PNerves*	*18PNerves*	*18PNerves*	*18PNerves*
19NeuroMuscJn	*19NMJn*	*19NMJn*	*19NMJn*	*19NMJn*	*19NMJn*
20Muscles	*20Muscles*	*20Muscles*	*20Muscles*	*20Muscles*	*20Muscles*
21Tendons	*21Tendons*	*21Tendons*	*21Tendons*	*21Tendons*	*21Tendons*
22Bones	*22Bones*	*22Bones*	*22Bones*	*22Bones*	*22Bones*

"*Survival*" in Neurology also often equates to Movement—in a sense the sole purpose of the Nervous System is to move a multicellular organism—out of perceived danger. Each "sign" that depends *on **Movement*** must also include consideration of bone, tendon, muscle function before it can be attributed to a neurologic cause.

As you look at the Model closely you will remember that in Disease, single or multiple Floors and Corridors may be involved: all of them need to be tracked down, documented, and evaluated. Do not assume anything!

As you review the Building remember that, because any Pathway—motor or sensory—can be affected at many Floors, *Symptoms or Signs from a higher level may affect your ability to examine lower levels* and vice versa. If a particular level seems involved, the higher levels must be reviewed to exclude a focal problem higher in the Building.

Signs and Symptoms always entail ***Spectra***. Spectra also abound in test results, treatment responses, patients' expectations. There is a *Continuum* of findings in most disease states. Most disease processes are a *work in progress* and closing off differential diagnostic possibilities too early should be avoided.

In older patients or those who have Neurologic disease from a young age it may take a very small further neurologic insult (or even a non-neurologic insult) to cause major deterioration in function. *Function is always a relative term*.

A Brief Word on Inspection

It seems odd that Inspection has to be dealt with after the preliminaries. This aspect of the Historical and Physical Exam is the epitome of the meaning of the word "Art" of Medicine. It is the most critical faculty to develop, involving *training your senses* to look for differences—from your expectations of the previous appearance of the patient and the appearance of this patient compared to others.

It involves, largely, the facial appearance (alertness, read and reading emotions, expressivity, play of muscles / eye contact); the postural appearance (withdrawn, contractures, leaning); the social appearance (kempt or unkempt, shaved, hair combed and tidy, clothes ironed, appropriate gestures and responses to facial expressions, communication skills intactness, social skills playing out—completeness and intactness). Yet, also, the inspection of surroundings—relatives / friends / accompanying companion / equipment / response to secretary, Nurse / technician / tests.

Again, the most critical skill to develop is understanding the *relative Internal and External Consistency* of everything that you note from your eyes, your ears, your sense of smell—and your knowledge of the psycho-social circumstances of *that* patient (ethnic, social, religious, educational group, social stratum) and the social mores that *apply at the time to that age group*.

When considering the relative Internal and External Consistency of what you noted, *then* the application of what you know about the disease process, and its treatments, comes into play. If anorexia, nausea, anxiety, depression, isolation are accompaniments of disease or therapy—these will play out in the panoramic vista before you. To misinterpret an effect / accompaniment of disease for a separate pathology would be disadvantageous for all concerned.

When considering all of the above you quickly realise why it takes so long to acquire this skill—indeed perhaps, no one fully acquires these skills because no doctor is exposed to the sum total of all Humanity.

The Cranial Nerves

With Cranial Nerves travel horizontal *corridors* from the Brainstem.

Issues with Cranial Nerves require a little more work because several have mixed sensory and autonomic fibres; several have more than one nucleus in other locations and some have contorted pathways.

Several Cranial Nerves being involved together give rise to localisable syndromes—more clues to diagnosis, pathologies, investigations and therapies.

Legend for Table Below: SNI—Supranuclear Influence; N—Nucleus; ACF– Ant Cranial Fossa: MCF: PCF: IM—Intramedullary; SAS—Subarachnoid Space: P—Pons: M—Medulla: CS—Cavernous Sinus; SOF—Sup Orbital Fissure; FO– Foramen Ovale: IOM—Internal Auditory Meatus: JF– Jugular Foramen: HC—Hypoglossal Canal: FM—Foramen Magnum

Cranial Nerve	Symptoms	Signs Depend on **location**—either several signs together *or their absence* can give a clue to location
1 F Lobe	Smell	Cribriform plate ; olfactory tract in ACF
2 Mid CranFossa	Vision	Retina; Orbit; Optic canal; Sella turcica; Chiasm; Optic Tract; Lateral Geniculate Body
3 Midbrain	EOM	SNI; N; SAS; PCF; MCF; CS; SOF; Pupil/Recti x3/InfOblq
4 Midbrain	EOM	SAS; MCF; CS; SOF; Sup Oblique
5 Pons	Sense, Mas-tication	Pons; IM; SAS; CS; SOF/IOF/FO; Temp /Masset /Pteryg; Sense—Ant Face, tongue, gums-teeth, sinuses, meninges
6 Pons	EOM	P; IM; SAS; CS; SOF; Lateral Rectus
7 Pons	Face Movt, Taste	SI; N; SAS; IAM; Orbicularis Oculi, Nasalis, Orbicularis Oris, Mentalis, Platysma; taste anterior 2/3 tongue
8 Pons	Hear-Bal	SI; N; SAS; IAM; Vestibular Apparatus and Cochlea
9 Medulla	Pharynx	SI; N; SAS; JF; Stylopharyngeus; Taste 1/3; Carotid Body
10 Medulla	Pharynx	SI; N; SAS; JF; Laryngeal / oesophageal m;
11 Medulla	Sternomast	SI; N; SAS; FM; JF; Trapezius, Sternomastoid
12 Medulla	Tongue	SI; N; SAS; HC; Tongue

How to Deal with Symptoms Effectively

Symptoms are the calling card of a disease: a patient's plea for help: a reflection of their interpretation of their body's survival instinct.

A System for Symptoms: CASTMQ

C– for *Chronology*—the most important aspect: How did this start? The "**first 15 sec" rule** helps. Take the patient, relative, eyewitness carefully through, second by second if need be, the first 15 sec of onset of the symptom!! **It is critical**.
A—for *Associated / Aggravating / Alleviating / Absent* Symptoms.
S—for *Site and Severity*
T—for *Therapies previously tried*: Medications; effectiveness; doses taken; built up slowly or quickly; doses at which side effects occurred; generic or propriety; did he actually take them or bought them and then discarded them; self-medication with over the counter or spouse's tablets; withdrawal of medications
M—for *Modifying factors*; when walking uphill / eating chilli / looking up
Q—for *Quantity and Quality* of the symptom.

So all symptoms become **CAST** members.

Notice that the above sequence of sorting out a symptom is often the exact *Opposite* of what a patient thinks you need to know.

Each symptom gained through the above algorithm must itself be re-entered to the algorithm. So each symptom and all its derived CAST members are repeatedly put through the algorithm until one is happy that all symptoms align—that they are *Consistent*.

Each aspect of the Models, as well as all symptom interrogations must be Consistent, both *Internally and Externally*. One is always checking one's initial working Hypothesis with every other aspect—not only at the time that you are applying the Models and tests—but also over time.

If the inherent Consistency of what you believe to be happening falls off, *Re-evaluate*! If something doesn't fit in your exam of the history or the person look at it again! Get someone else to look at it if needs be.

Much of your time will be spent honing your skills in getting a satisfactory history. Begin early; speak to patients every day and often!! Listen to senior doctors asking questions—the questions are the keys to prise open the unknown.

And once you have asked the question, Listen to the patient closely and carefully. Between all the concerns, false starts, poor hearing and mixed expectations, the patient is really trying to tell you what is wrong with him. His survival depends on it.

Examination Technique for the FRACP

There are many different approaches to the FRACP Examinations: this is one that I, and many of your colleagues, have found useful since 1994.

Preliminaries

There are three interested parties to the examination—patient, examiners, yourself. You are the junior consultant, taking the senior consultants on a review of several patients.

Your "*Demeanour*" should be that of the optimum consultant—let's call them Consultant Attitudes for short. Imagine looking after a distant relative—expressing in your body and spoken language, the respect and sympathy for a fellow human being who has been afflicted; expressing the courage that you ***must*** transmit—of someone who cares for the person and shall use all skill and knowledge for their benefit. It goes without saying that these same qualities must be perceived by your examiners.

Critical Elements

In every examination there is a "giving" component, from you and a "getting" component—from patient and, sometimes, examiner.

Introduction to the Patient

Giving

First Impressions Count! Your Consultant Attitudes should be foremost. Look the patient directly in the eye and speak to him: reach out with your right hand, confidently convey the same message as you gently grip their hand.

Getting

A) Facial symmetry and movements; recognition of a social pact with a stranger; co-operativeness to engage may reflect on mental state.
B) Haltering movements; tremor; lack of care attitude; unawareness of deficits.
C) From Examiner—if marked deficits, co-operation limits need be taken into account.

Positioning Patient

Giving

Watch that your Body Language, Speech and Movements still convey the Consultant Attitudes.
Depending on your height and which part of the Nervous System you will be examining, and telling the patient and examiner what you are doing and why, put their bed up or down; match it with your seating height for eye examination.

Getting

Assess: cooperativeness; awkward movements; failure to comprehend; pain; tremor; weak movements of upper and lower limbs during positioning (bulk or fine). Again, if major difficulties are expected , let the examiners know.

Exposure

Exposing the appropriate parts of the body during neurologic examination is critical to avoiding missing a surgical or traumatic scar that may hold a major clue.

Continue to convey all your Consultant Attitudes—nothing annoys patients or examiners if someone slips back into an uncaring attitude. (Rich gifts wax poor when givers prove unkind!)

Giving

Clear directions and purpose—for both patient and examiners; smooth movements and help patient where it is needed—NOTING why you needed to help.

Depending on which parts of the Nervous System you are asked to examine, you will need to expose:
A) Back of Head;
B) Nape of neck and upper chest;
C) Thoracic spine entirely;
D) Lumbar and Sacral Spine entirely;

E) Hips for scars and contractures;
F) Full Upper or Lower limbs for any scars, lumps, discolouration.

Getting

Socialising / communicating / language skills.
Movements of:
A) Axial musculature and bones,
B) Shoulder and Hip Girdle movements and their limitations,
C) Bulk movements of upper and lower limbs with ascertainment of their confidence or reluctance
D) Lack of concern about obvious disabilities

<u>In Conclusion</u>

By the time you have observed the patient do all the above—in PREPARATION for the actual examination—you have essentially screened the whole nervous system from highest cortical function to the level of the bones (see table in the Manual). It is unlikely that you will miss anything of note and you can now confidently go on to examine the SPECIFIC part of the nervous system alluded to in your stem before you walked in to see the patient.