NETT Investigator Retreat

ADVISER Trial: Acute Dizziness Video-oculography for Impact on Stroke in the Emergency Room

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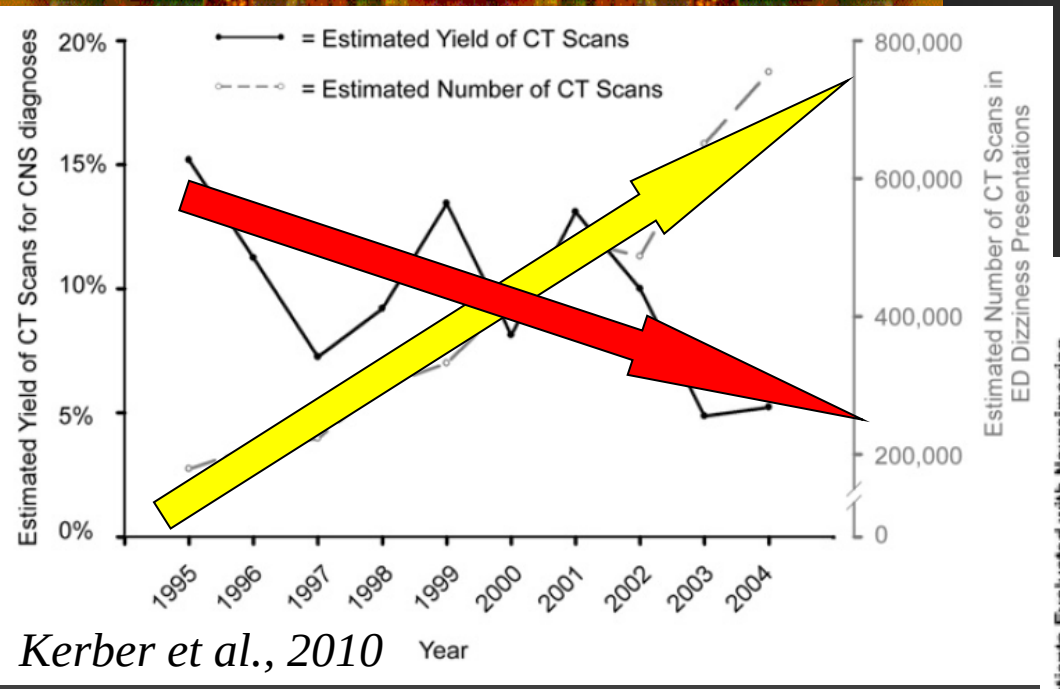
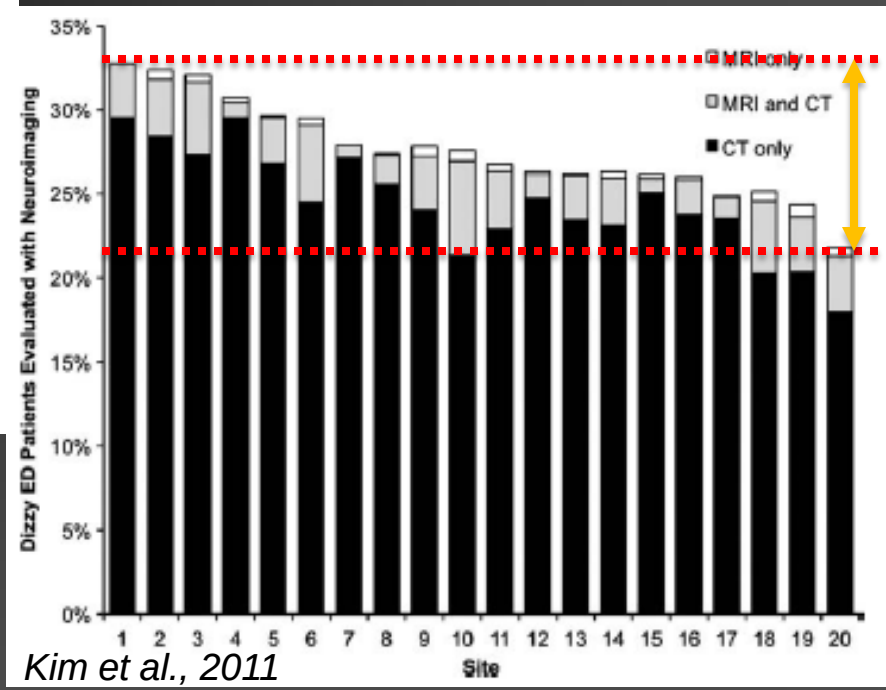
Background
Dizziness Common, Tricky, High-Stakes

- ~4 million ED visits/yr US for dizziness
  (at a total ED cost of $4 billion annually)
- ~4-6% have CVA (~160-240,000/yr)
  (ischemia of lat. brainstem & inferior cerebellum)
- ~35% are missed (~35-50,000/yr)
  (versus 4% for those with motor symptoms)
- up to 40% adverse outcomes (~~15-20,000/yr)
  (disproportionately affecting those <50yo)

Background
Imaging Overuse and Practice Variation



Kerber et al., 2010

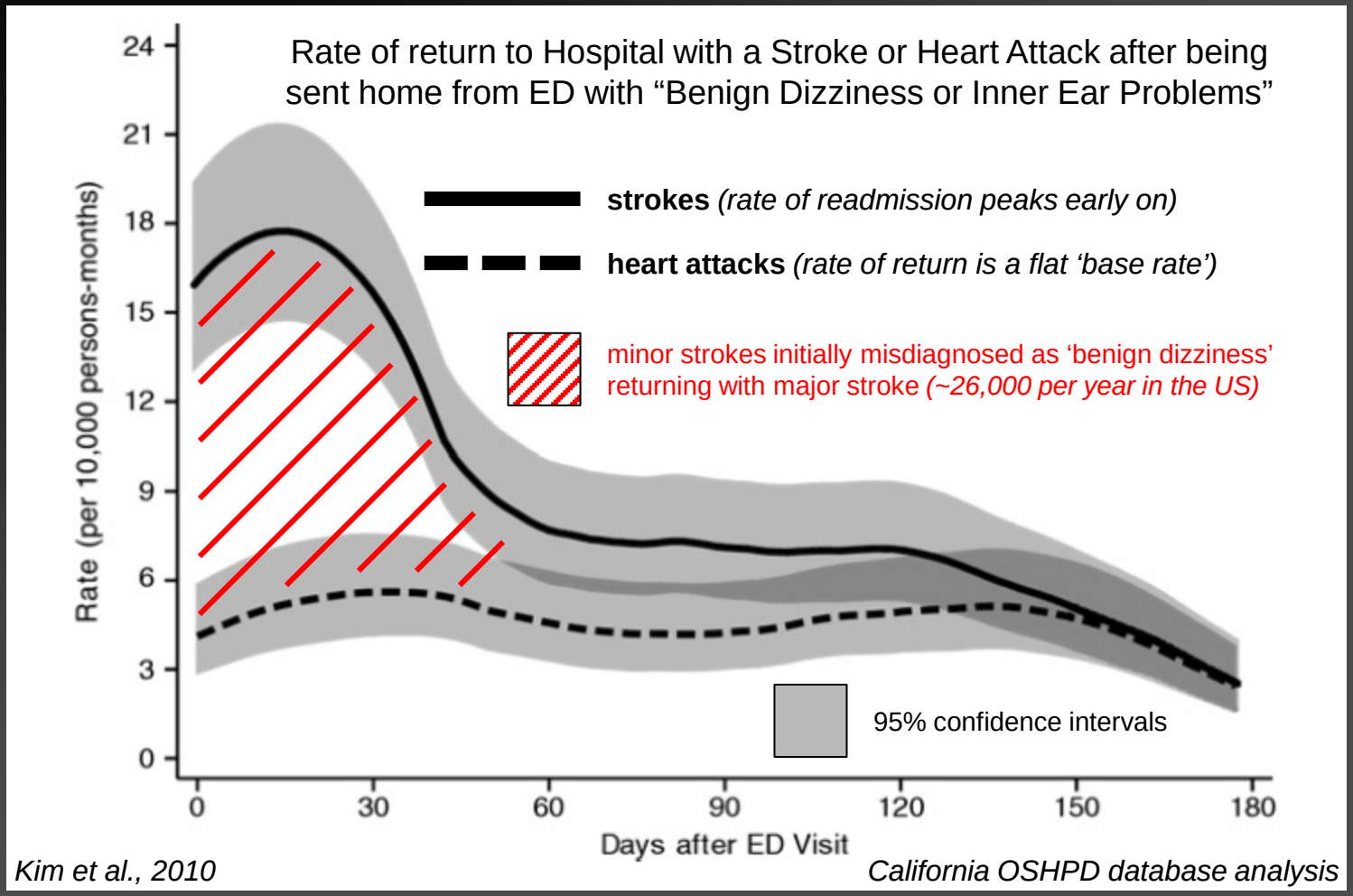


Kim et al., 2011

Total Cost $4 Billion/yr in US EDs
another $5 Billion/yr for admissions
~$1 Billion/yr 'wasted' (CT/admit)

#1 Requested Adult EM Decision Rule
Eagles et al., 2008

Background
Missed Stroke in "Benign" Dizziness



Kim et al., 2010

California OSHPD database analysis

Background
Acute Vestibular Syndrome

- acute, continuous dizziness, vertigo, or gait ataxia lasting days to weeks with nausea or vomiting, head motion discomfort, nystagmus
  - ~75% peripheral (vestibular neuritis/labyrinthitis)
  - ~25% central (80% stroke, almost all ischemic)
- ~10-20% of all ED dizziness, ~80-90% of strokes
- ~80% no focal neurologic signs (‘isolated’ AVS)
- fraction of isolated AVS with stroke ~20%

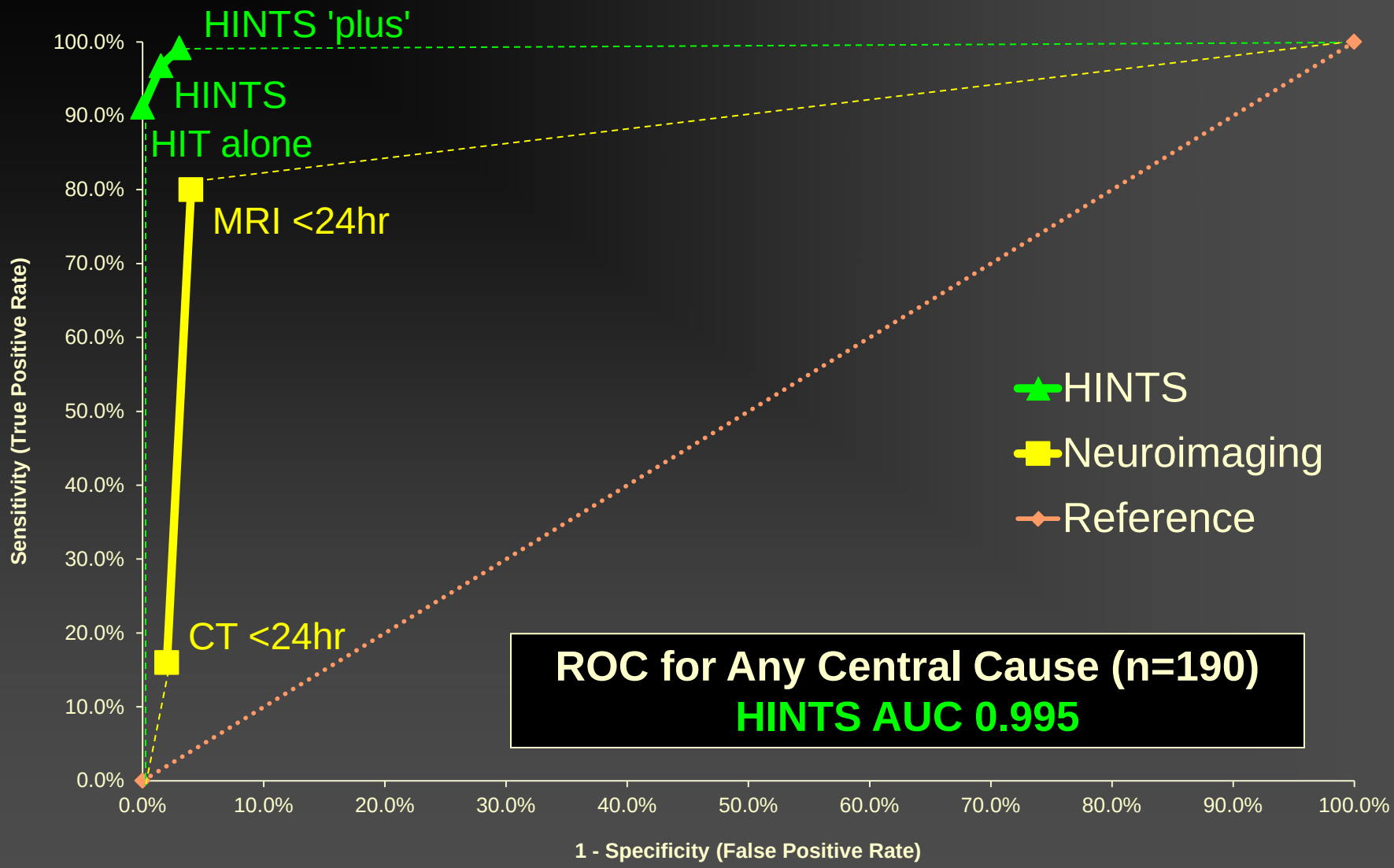
3 bedside oculomotor findings: H.I.N.T.S.

Head **I**mpulse

Nystagmus

Test of **S**kew

ROC Analysis: Expert HINTS vs. Neuroimaging for Stroke in Acute, Continuous Dizziness/Vertigo



Background

H.I.N.T.S. vs. MRI within 48hrs of Onset

HINTS – any one of the three bedside oculomotor findings predict stroke with pooled…

- sensitivity 99.2%, specificity of 97.0%
- negative likelihood ratio (NLR) “rule out power” of HINTS vs. acute brain MRI DWI <24-48 hrs

HINTS bedside	NLR	0.01 (95% CI 0.00–0.06)
Acute MRI DWI	NLR	0.21 (95% CI 0.16-0.26)

If the patient has a 50% chance of stroke…
Benign HINTS = <1% vs. Negative MRI = 17%

But…

Can this be done reliably in the ED?

The "Eye ECG"

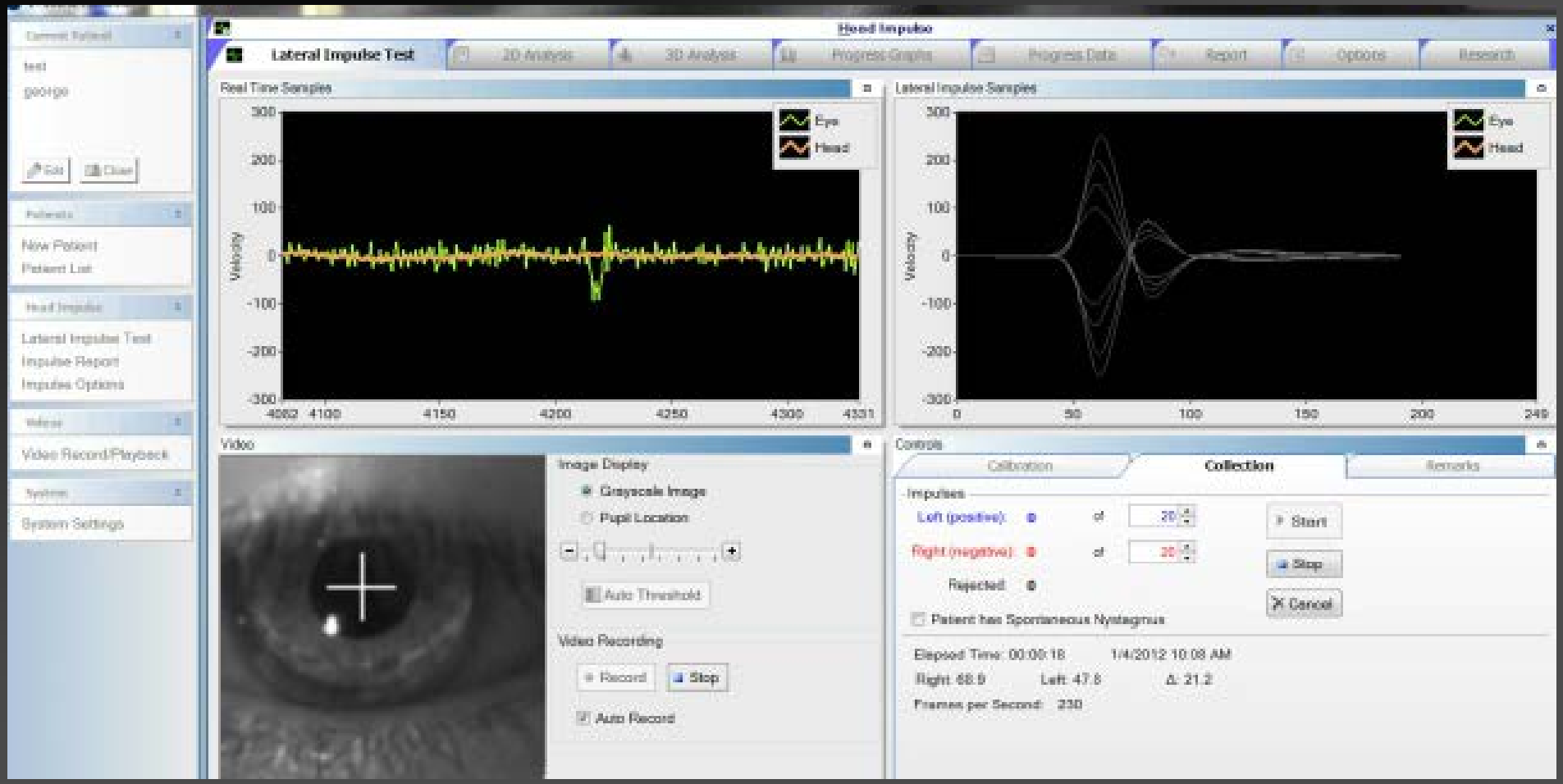
Portable Video-Oculography (VOG)

Expertise in a box

Newman-Toker

The "Eye ECG"

Portable Video-Oculography (VOG)

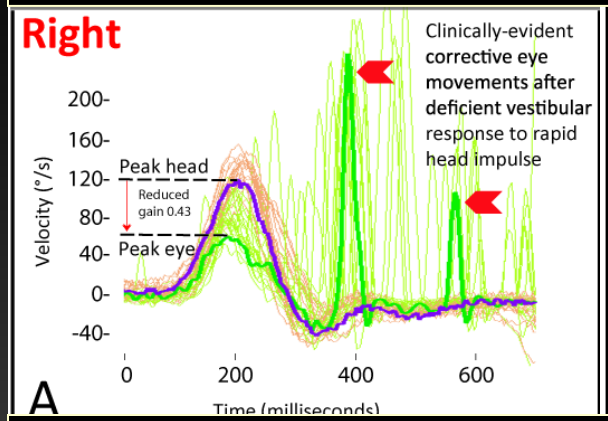


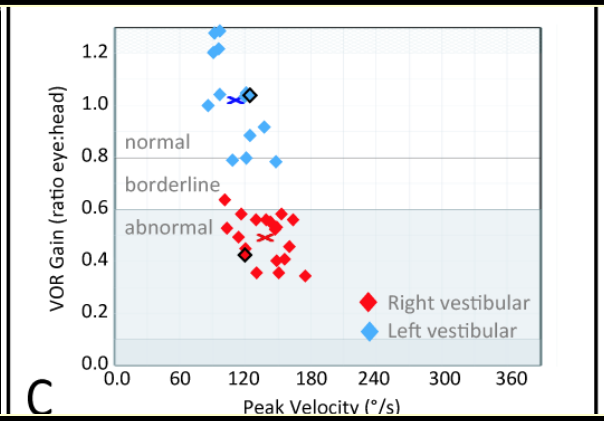
Newman-Toker

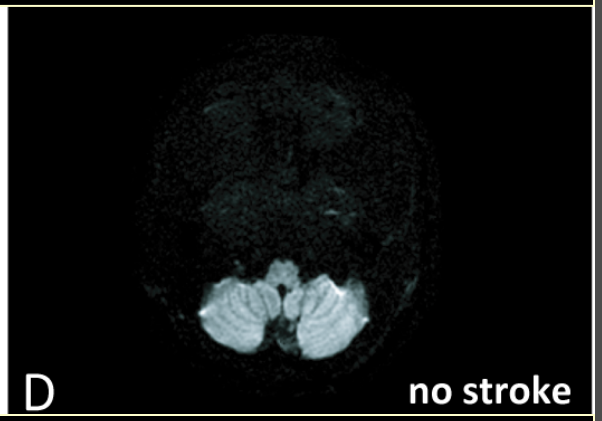
The "Eye ECG"

Vestibular Neuritis vs. Stroke

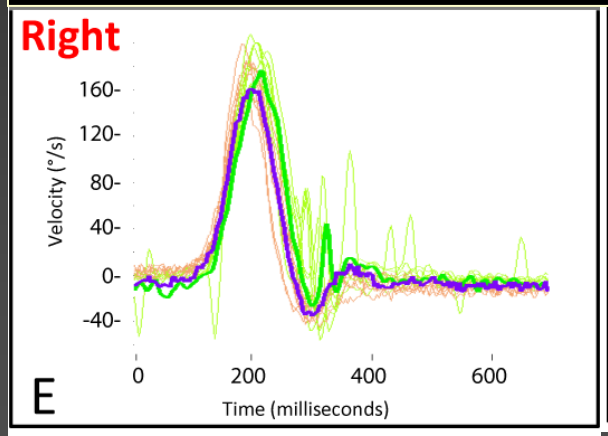
60yo AVS - Neuritis

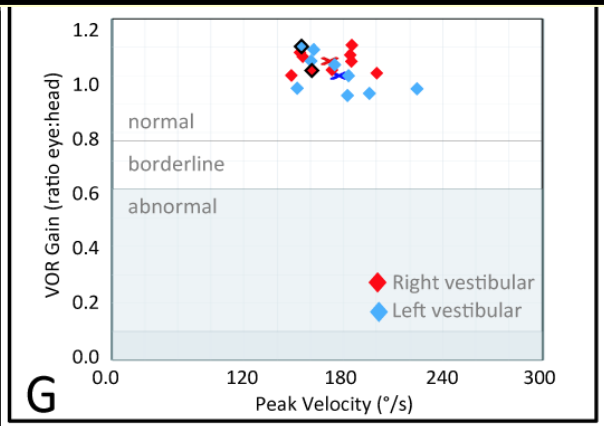


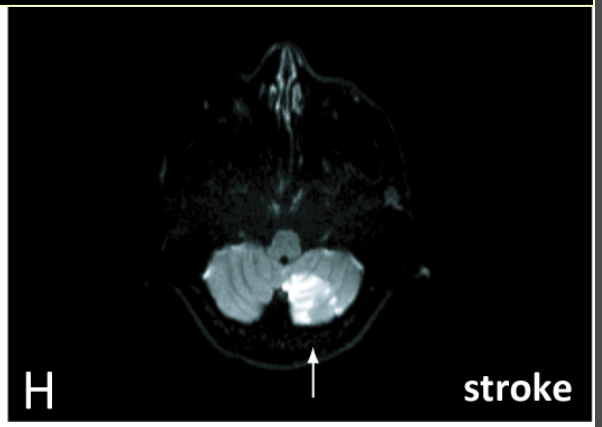




30yo AVS - Stroke

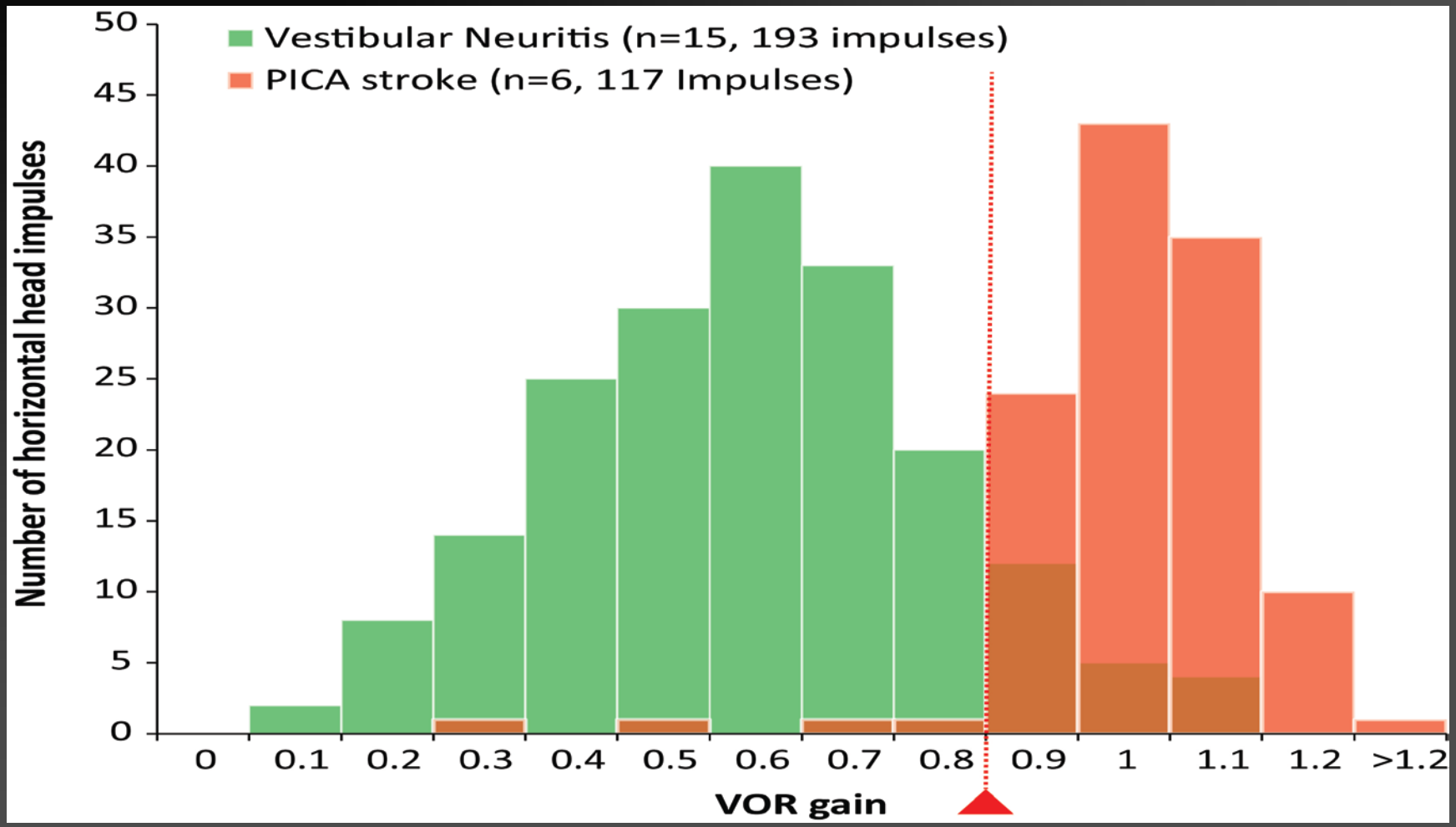




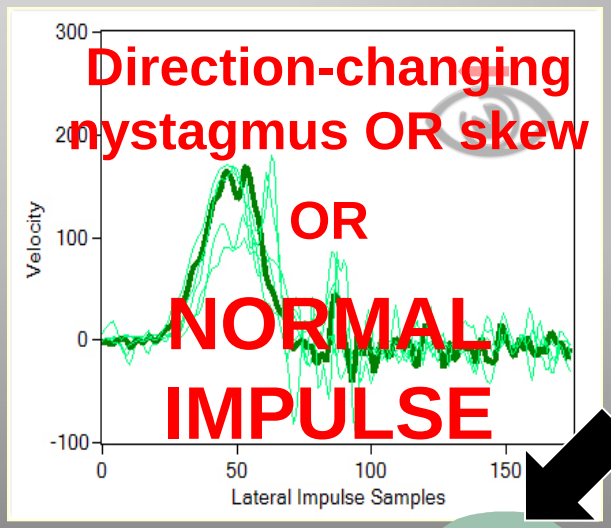


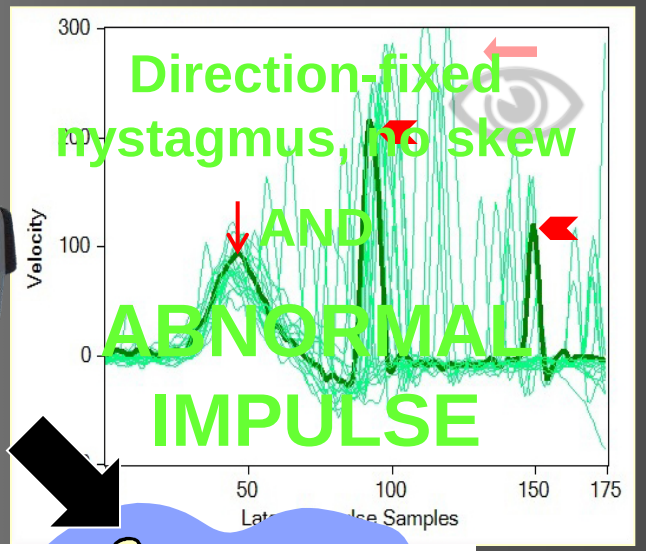
The "Eye ECG"

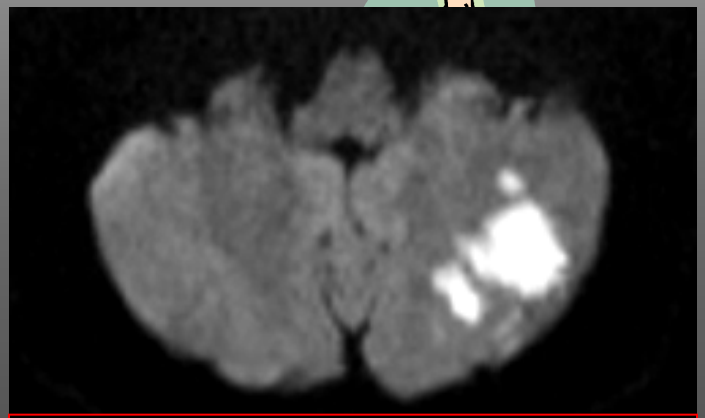
VOG Interpretation is Clear



Acute Continuous Dizziness or Vertigo





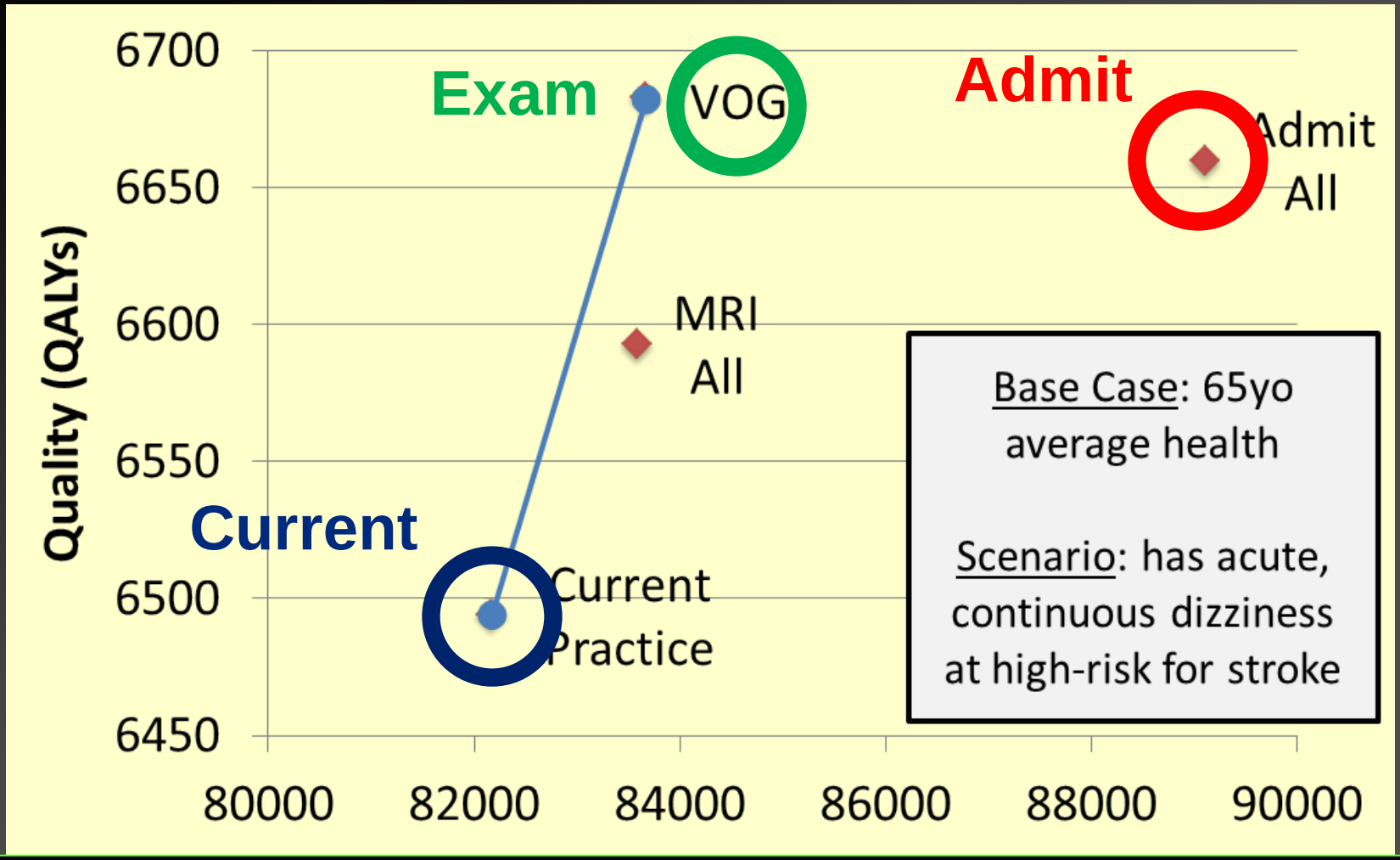


Posterior Circulation Stroke

Vestibular Neuritis

The "Eye ECG"

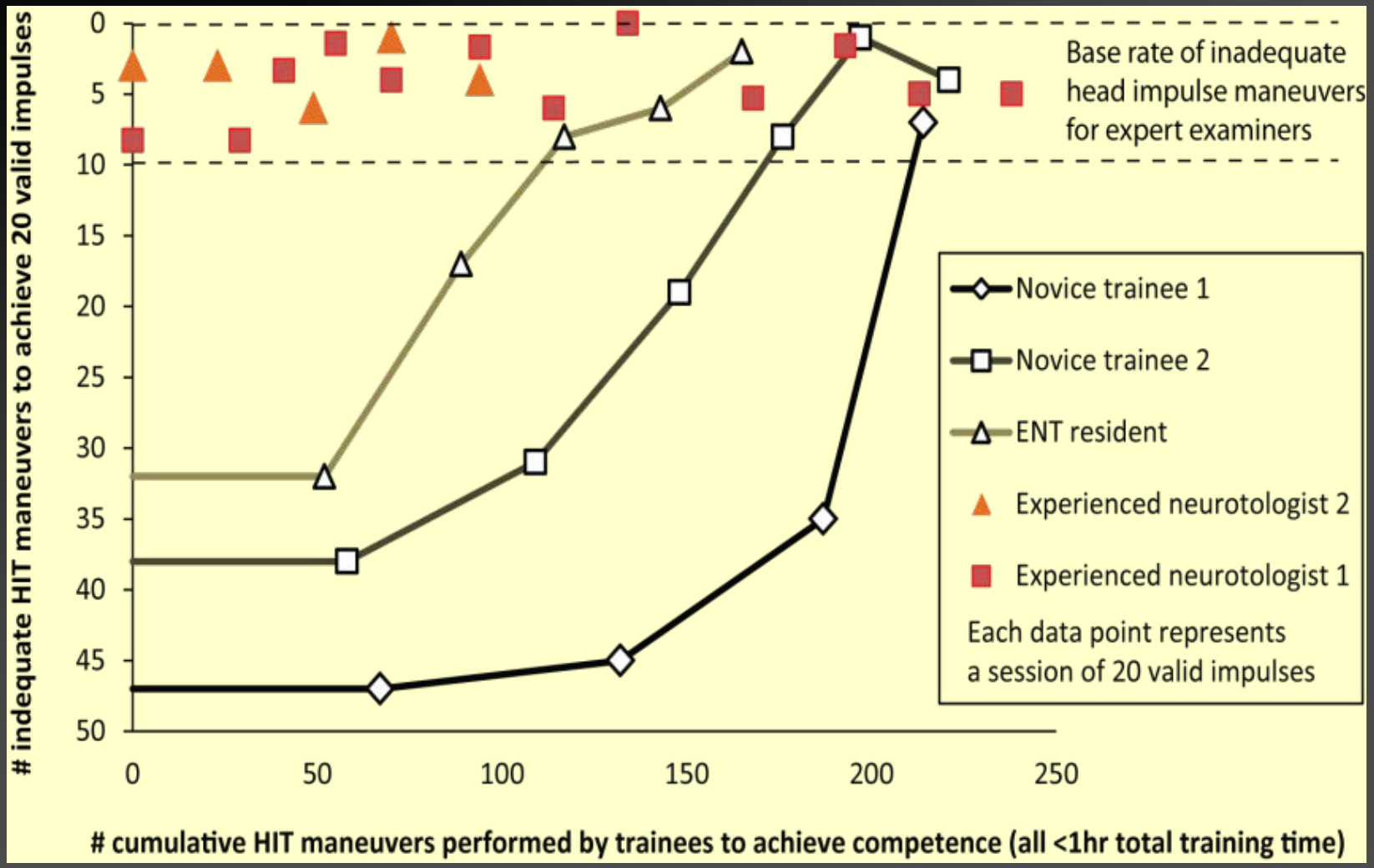
VOG will be Cost Effective



Optimized Bedside Exam/DDSS $8K/QALY

The "Eye ECG"

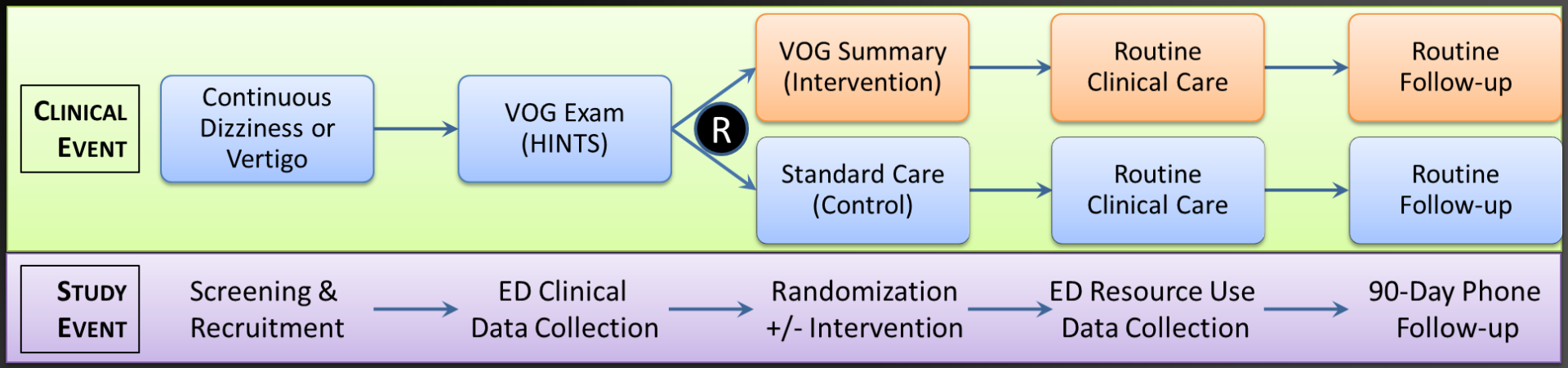
Novices Trained to Expert in <1Hr



ADVISER
Patient Population

- **Inclusions**:
  - adult (≥18yo) with chief symptom of dizziness, vertigo, or acute gait unsteadiness/ataxia
  - continuous symptoms ≥1 hour < 72 hours
  - spontaneous or gaze-evoked nystagmus
- **Exclusions**:
  - critical illness or acute head trauma
  - unsafe (cervical injury) or unable (delirium) to do VOG
  - NIH stroke scale score >0

ADVISER
Proposed Study Design



- Design: RCT (patient-level, parallel, 1:1)
- Intervention: VOG-enhanced diagnosis
- Powering Endpoint: proportion 90-d mRS >0
- Approximate Sample Size: ~3000

ADVISER
Design Questions for Discussion

- VOG as part of screening to identify nystagmus?
- Comfort with control arm VOG (‘black box’ result)?
- Patient-level vs. cluster (physician/site) RCT?
- NIH SS >0 exclusion vs. no hemi-motor?
- Intervention married to treatment protocol (VOG-enhanced diagnosis vs. VOG-guided care pathway)?
- Consider combined QOL endpoint (stroke + vestibular)
- Consider diagnostic or ‘correct Rx’ endpoint (for stroke +/- vestibular diagnoses) [or 2-stage design with Dx Stage 1]