Adapting your eye exam routine to the
digital age

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PLAN

INTRODUCTION
SYMPTOMS & HISTORY
REFRACTION
ACCOMMODATION TESTING
BINOCULAR VISION TESTING
PATIENT MANAGEMENT
CONCLUSIONS

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Escape from your routine

- “I run my business for the convenience of the customers, not the staff!” — Bettine Evans
- Your eye exam routine should be for your patients, not for your convenience — Bruce Evans
- Adapt your routine to the patient’s needs
- If you do the same routine more than twice a day, then you are either working in the wrong way or in the wrong place!
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**Vocation, history, symptoms**

- **Workplace factors:**
  - Needs to be more detailed than most clinical record systems suggest!
  - The only general rule about working distance... is that there is no general rule
  - What do they do & where do they do it?
  - You measure, or if engineer, they measure!
  - How feasible is it to adjust workstation?

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**Vocation, history, symptoms**

- **History:**
  - Extraocular muscle palsies
- **Symptoms:**
  - New or old?
  - Does symptom onset relate to any changes at work?
    - E.g., new: desk, office, lighting, PC?
  - Related to task?
  - Internal or external?
    - But, symptom specificity is poor
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**Non-tolerances: conclusions**

- Over 80% of non-tols are presbyopes
- **Don’t over-plus or under-minus**
- Partially prescribe
- Demonstrate the change
- Warn about adaptation
- Consider non-tols as an opportunity by excelling at dealing with these challenging patients

Freeman & Evans, 2010

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**Visual acuity reserve (VAR)**

- Conventional view is that acuity reserve (VAR) needs to be 2-3x for fluent to maximum reading (Lovie-Kitchin & Whittaker, 1999)
- Kochurova, Portello, Rosenfield (2015) argued 2x reserve is appropriate for computer users
- Data with digital devices indicates VAR 6x for optimal reading (Ko et al., 2014)
- Users move closer to monitor when glare present
- “when individuals can freely adjust their posture & chair, they also select a viewing distance that increases the visual angle of font toward 23 arcmin” (largest used in research, ~N15)
- Larger font improves productivity
- Applied to younger participants as much as older
Refraction

- Obtain refraction for all the relevant distances
  - Phoropter use OK, but with very sensitive patients will need to check with Rx in trial frame
  - Rosenfield (2016) noted 0.50-1.00DC can increase symptoms in computer users
- Is a compromise Rx (same Rx for more than 1 distance) feasible?
  - Age/accommodation
  - What is difference between distances required?
  - Pupil size
  - Patient tolerance
    - Size of detail
    - Personality
  - Cannot apply simple rules for determining Add
    - Need to measure

Case study (13035)

- 73 year old male, average pupils (not small)
- Symptoms: "can't see engineering workbench & food preparation as current N glasses too strong"
- Distances estimated:
  - Reading books: 45cm
  - VDU: 55cm
  - Workbench & food: 90cm
- Rx: R+1.00/-1.00x107.5 6/7.5 L+1.25/-0.75x80 6/6
  - Reading books: 45cm Add+2.25
  - VDU: 55cm Add+1.50
  - Workbench: 90cm Add+0.75
- Current glasses:
  - Distance (no change)
  - Vocational (VDU at top, NV at bottom; no change)
  - Reading (Add+2.50)
- Solution: new glasses Add+0.75; discuss safety requirements

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Accommodative anomalies

- Accommodative paralysis
- Accommodative insufficiency
- Accommodative fatigue
- Accommodative infacility (inertia)
- Accommodative spasm (excess)

Accommodative fatigue

- Accommodative fatigue: accommodation cannot be sustained for long periods of near vision
- A reduction in the amplitude of accommodation with repeat testing
- May be a milder form of accommodative insufficiency

Accommodative inertia (infacility)

- Accommodation responds slowly
- Can test with flippers
  - Count cycles per minute
  - A flip from plus to minus is ½ a cycle
  - Dynamic assessment of accommodative system
  - Norms - age dependent
  - Ideally, with suppression check
  - Several confounding variable, ideally, use a control condition
- More natural to test with Hart chart or similar
Amplitude Accomm. testing

- Best practice is to test accommodation amplitude in pre-presbyopes...BUT
- Measurement of AoA with ruler is prone to 15+ sources of errors
  Burns, Evans, Allen (Optometry in Practice, 2014)
- E.g., amplitude of accommodation can vary significantly with gaze angle
  (Rosenfield, 2017)
- Still best to determine the add subjectively at the relevant distance

Accommodation in reserve (Millodot & Millodot, 1989)

- Determined Add subjectively & related to accommodation available
- % of accommodation used for a comfortable reading varies with distance:
  - At 33cm one third of accommodation in reserve
  - At 25cm half of accommodation in reserve
  - But very large inter-subject variation
- Conclusions:
  - "the 'one half of accommodation in reserve' rule was found to be valid in most cases, except for women between the ages of 40 and 52 and men beyond 63 years of age who behaved differently for reasons unknown"
  - Relevance to DES: determine the Add subjectively at the relevant distances

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Motility test

- Use reliable pen torch
- Check nose not occluding
- Really, three tests, so do three times:
  1) Observe corneal reflexes
  2) Cover test in peripheral gaze
  3) Ask about diplopia
- Beware of reports of diplopia
  - May break down (in view of target, distance, fus. res.)
  - May be variable
  - May be confused
- Know the muscle actions (RADSIN)

Actions of Superior Muscles

[Diagram showing actions of superior muscles]
LINDBLOM’S METHOD

70cm rod at 1m, or double Maddox rods (<10° one SO)

Where there is maximum diplopia, are the two images parallel or torsional?
parallel: RSR, RIR, LSR, LIR  torsional: RSO, RIO, LSO, LIO

If parallel:
1. Where is the vertical diplopia greatest?
   upgaze: RSR, LSR
downgaze: RIR, LIR
2. Does the separation increase on R or L gaze?
   R: RSR, RIR
   L: LSR, LIR

CONCLUSION: PARETIC MUSCLE(S):  

Lindblom, Westheimer, Hoyt (1997)
Common incomitancies seen in optometric practice

- Superior oblique palsy
- Duane’s syndrome
- Lateral rectus palsy
- Brown’s syndrome

Become familiar with what these look like:
- CD in Pickwell’s Binocular Vision Anomalies, 5th edition
- NB: all these are rare compared with “pattern strabismus” (e.g., A-syndrome, V-syndrome, etc)

SO palsy

- Usually:
  - Hyper-deviation of affected eye, worse in down-gaze
  - under-action of affected eye when looking down and in
  - More likely to have symptoms with reading than with distance

- But, may have secondary sequelae
- Avoid fitting multifocal spectacles or monovision

Pattern strabismus/phoria

- V-syndrome: converge more than 15∆ from upgaze to downgaze
- A-syndrome: diverge more than 15∆ from upgaze to downgaze
- About 1 in 5 patients with strabismus may have an A- or V-pattern (Biglan, 1999)
- Also common in people with heterophoria
- Other patterns exist
- https://www.slideshare.net/Amrit_Pokharel/av-pattern-strabismus

- Important to detect “patterns” and advise on placement of monitor, tablet device, etc
- NB also relevant for other conditions that are gaze dependent (e.g., nystagmus)

Video clip source: CD-ROM in Evans (2007)
Pickwell’s Binocular Vision Anomalies, 5th edition
Incomitancies: conclusions

- Some incomitancies are difficult to detect
  - If symptoms are suspicious, do cover testing in peripheral gaze
  - Testing for cyclo-deviations detects SO palsies
- Refer new or changing incomitancies
- In some long-standing cases, prescribing the prism indicated by the Mallett unit may help
- Consider effect of incomitancy on workstation
- Test binocular alignment and compensation under conditions replicating the habitual working conditions (Rosenfeld, 2016)

KEY SIGNS OF DECOMP. PHORIA

- Symptoms
- Poor cover test recovery
- Aligning prism (FD test)
- Low fusional reserve opposing phoria
  - Sheard's criterion
  - Particularly useful for exophorias
- For esophorias, size and imbalanced fusional reserves are relevant
- For hyperphorias, size matters

ALIGNING PRISM: Mallett Unit

- aligning prisms/spheres to eliminate FD
- good foveal and peripheral fusion lock
- question set is important
  - ask if a line ever moves
    - Karania & Evans (2006)
  - for symptomatic phoria:
    - sensitivity 75%
    - specificity 78%
    - Jenkins, Pickwell, & Yekta (1989)
ALIGNING PRISM: Mallett Unit

- Maintain normal binocular vision
  - Increase lighting, full field of view
  - Use hand held loose prisms
  - Minimum prism for alignment
  - Re-normalise BV between prisms
  - Prism dioptrre steps: 0.5, 1.0, 2.0, 4.0
  - Test in habitual gaze

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Patient management

- Discuss the options, including pros & cons
- Presbyopes:
  - PAL
  - vocational
  - single vision
  - CL
- Pre-presbyopes:
  - single vision
  - accommodative support
  - CL
- Phoropter is good for initial determination of add, but
  - In the consulting room, simulate patient’s working conditions and let the patient check your proposed Rx with a trial frame
Keeping your patient for life

- Customised care is the secret to patient retention
- The handover from optometrist to optician is crucial for the patient & the practice

Good approaches to handover:
- Optometrist does eye exam & dispensing
- Optometrist calls optician into consulting room, ideally before final management discussion
- Optometrist takes patient to optician and reviews management discussion

Bad approaches to handover:
- "Go and see the optician"
- Leave notes for optician to pick up

Worst outcome is patient has dispensing elsewhere
- Not in the interest of the patient or the practice
- Best avoided by integrated pathway from eyecare to eyewear

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Additional points

- dry eye workup also important
  - Computers don’t affect blink rate, but increase proportion of incomplete blinks
    (Chu et al., 2014)

- UK perspective sceptical about blue light blocking for computer users
  - Sunlight exceeds typical levels of artificial lighting by a factor of 100 times or more
    (Wang et al. 2015)
  - The amount of short-wavelength radiation emitted from digital screens is far smaller than from most artificial light sources
    (Rosenfield 2016)
  - Blue filtering lenses “have very little effect on incident light/energy”
    (Dickson 2017)
  - Lack of high quality evidence

- "attenuation of short wavelength blue-violet for everyday wear clear lenses seems a sensible development”
  (Lawrenson & Hull 2017)
  (Marshall, 2017)
Conclusions

- Every patient is unique, and this has never been truer than in the digital age.
- The best way to help your patient is to customise your eye exam to their needs.
- Dispensing also needs to be customised to each patient's needs.
- Handover from optometrist to optician is essential.
- A patient with complex visual demands who is well-managed will be a patient for life.