



RANZCO

The Royal Australian
and New Zealand
College of Ophthalmologists

Clinical Refraction Curriculum Standard

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Purpose

"Indeed, of all aspects of medicine this practice [refraction] gives people more comfort and increased efficiency than any other medical technique"

Sir Stewart Duke-Elder, 1970

Refraction is a core skill in ophthalmology; it is not just a method of optimising the visual acuity but is also a diagnostic and therapeutic tool. All ophthalmologists need to be able to refract – some need to have first-class skills with objective refraction in particular.

References

Clinical Refraction Reading

In addition to the core texts, the following references are recommended:

- Elkington, A.R., Frank, H.J., & Greaney, M.J. 2006, *Clinical optics*, 3rd edn (reprinted), Blackwell Science, Oxford.

Additional Reading

- Duke-Elder, W.S. & Abrams, D. (eds) 1970, *System of ophthalmology*, vol. 5 Ophthalmic optics and refraction, 2nd edn, Henry Kimpton, London
- Milder, B., & Rubin, M.L. 2004, *The fine art of prescribing glasses without making a spectacle of yourself*, 3rd edn, Triad Pub. Co., Gainesville, FL.

Other Resources

The RANZCO Optics curriculum provides guidance on learning underpinning this standard. There may be some online resources that are of value, but discretion should be exercised regarding their accuracy. It is recommended that reading be supplemented with appropriate articles from current and relevant peer-reviewed journals.

Best Practice Standards

Refraction is a fundamental diagnostic and therapeutic tool. Trainees must be able to demonstrate, in practice and on assessment, that they meet the following standards:

1. Demonstrate an understanding of the principles of retinoscopy.
2. Demonstrate an ability to perform retinoscopy to within +/- 0.50 DS and +/- 0.50 DC; and axis to within 15 degrees.

Trainees must be able to record the results in the following forms:

- optic (power) cross, with working distance allowance included
 - in sphero/cylindrical form, with the working distance allowance removed.
3. Demonstrate an understanding of the principles of subjective refraction including:
 - refinement of the spherical component
 - refinement of the cylindrical component
 - subjective determination of spherical and cylindrical refraction
 4. Perform binocular balancing

5. Prescribe prisms in spectacle form.

Level of Mastery

For each learning outcome, the level of mastery to be attained by the trainee at the end of training is indicated as follows:

***	Core knowledge of which trainees must be able to demonstrate understanding Skills and procedures that trainees must be able to perform autonomously
**	Knowledge of which trainees must have a good practical understanding Skills and procedures with which trainees should have assisted, and of which have good practical knowledge
*	Knowledge, skills and procedures of which trainees must have some understanding

Learning outcomes and performance criteria

CR1 ADULT REFRACTION		
<p><i>This element covers the performance of refraction on an adult patient, and the prescription of spectacles.</i></p> <p><i>The trainee is expected to have obtained and recorded a general medical and ocular history (including family history) as outlined in the Ophthalmic Basic Competency and Knowledge (OBCK) standard.</i></p>		
LEARNING OUTCOMES	LEVEL OF MASTERY	PERFORMANCE CRITERIA
1.1 Determine and record previous spectacle and contact lens wear	***	1.1.1 Use questioning to elicit information about previous refractive corrections including: <ul style="list-style-type: none"> - multifocal spectacles - bifocal spectacles - soft and hard contact lenses - prism incorporated into spectacles <ul style="list-style-type: none"> • history of previous refractive surgery
1.2 Use manual or automatic lensometers to examine existing lenses and provide additional information to assist in the initial estimation of refractive error	***	1.2.1 Set up equipment as per manufacturer's specifications 1.2.2 Test lens correctly positioned on instrument 1.2.3 Establish lens centration 1.2.4 Correctly identify power of unknown lenses and prisms
1.3 Prepare and position patient for each test procedure	***	1.3.1 Explain test procedure to patient 1.3.2 Instruct patient what to do during the test 1.3.3 Adjust equipment to ensure test reliability, and patient and operator comfort
1.4 Use keratometry and/or corneal topography to assist in refraction as appropriate	**	1.4.1 Use a keratometer to quantify corneal astigmatism 1.4.2 Use a keratometer or topographer to exclude any signs of irregular astigmatism

<p>1.5 Obtain objective measurement of refractive error</p>	<p>***</p>	<p>1.5.1 Adjust retinoscope for plane or concave mirror effect</p> <p>1.5.2 Perform and interpret the results of retinoscopy allowing for working distance and noting any ocular disease</p> <p>1.5.3 Record refraction accurately</p> <p>1.5.4 Transpose results of retinoscopy to a provisional spectacle prescription</p> <p>1.5.5 Be familiar with the use of autorefractors and aberrometers in estimating refractive error</p> <p>1.5.6 Use cycloplegic refraction, where indicated</p>
<p>1.6 Perform subjective refraction</p>	<p>***</p>	<p>1.6.1 Accurately refine sphere and cylinder component of refractive error using:</p> <ul style="list-style-type: none"> • trial frame • trial lens set • Jackson cross cylinder • tests, including duochrome test, to avoid over-correcting myopes or under-correcting hypermetropes <p>1.6.2 Determine and individualize near vision requirement if indicated</p>
	<p>*</p>	<p>1.6.3 Be familiar with phoropter heads</p>
<p>1.7 Prescribe spectacles</p>	<p>*** —</p>	<p>1.7.1 Consider factors influencing final prescription:</p> <ul style="list-style-type: none"> • interpupillary distance (IPD) • BVD • anisometropia • amblyopia • prismatic requirement

<p>1.8 Advise on lens type, filters and coatings to suit individual needs</p>	<p style="text-align: center;">*</p>	<p>1.8.1 Discuss spectacle options with the patient to enable them to make an informed decision:</p> <ul style="list-style-type: none"> • tints • high index lenses • anti-reflective coatings <p>1.8.2 Discuss lens shape and materials, and frame types and materials, with patient to enable them to make an informed decision</p>
<p>1.9 Have a knowledge of prescription of contact lenses</p>	<p style="text-align: center;">**</p>	<p>1.9.1 Be familiar with different types of contact lenses and basic principles of fittings and prescribing contact lenses</p>

CR2 PAEDIATRIC REFRACTION

This element covers the performance of refraction on paediatric patients and the prescription of spectacles.

The practitioner is expected to have obtained and recorded a general medical and ocular history (including family history) as outlined in the Ophthalmic Basic Competency and Knowledge (OBCK) standard.

LEARNING OUTCOMES	LEVEL OF MASTERY	PERFORMANCE CRITERIA
2.1 Determine and record previous spectacle and contact lens wear	***	2.1.1 Elicit information about previous use and/or use appropriate equipment to measure existing correction
2.2 Prepare and position patient for each test procedure	***	2.2.1 Explain test procedure to patient and/or carer(s) 2.2.2 Instruct patient/carer what to do during the test 2.2.3 Adjust equipment to ensure test reliability, and patient and operator comfort
2.3 Perform cycloplegic refraction	***	2.3.1 Demonstrate understanding of the effects, duration, side effects and relevance of cycloplegic agents 2.3.2 Demonstrate understanding of the use and role of cycloplegic agents in the refraction of children
	**	2.3.3 Demonstrate understanding of: <ul style="list-style-type: none"> the indications for conscious sedation or general anaesthesia, to enable cycloplegic refraction or related procedures the effects of different forms of anaesthesia on the refractive state

2.4 Obtain objective measurement of refractive error	<p style="text-align: center;">***</p>	<p>2.4.1 Adjust retinoscope for plane or concave mirror effect</p> <p>2.4.2 Record refraction accurately</p> <p>2.4.3 Record refraction to within 0.50 dioptre sphere and cylinders and axes to within 15°</p> <p>2.4.4 Translate results of retinoscopy to a provisional spectacle prescription</p> <p>2.4.5 Use an autorefractor and be familiar with aberrometer in estimating refractive error</p>
2.5 Perform subjective refraction	<p style="text-align: center;">***</p>	<p>2.5.1 Attempt to refine sphere and cylinder component of refractive error if appropriate using:</p> <ul style="list-style-type: none"> • trial frame • trial lens set • Jackson cross cylinder • tests, including duochrome test, to avoid over-correcting myopes or under-correcting hypermetropes <p>2.5.2 Be familiar with phoropter heads</p>
2.6 Prescribe spectacles	<p style="text-align: center;">***</p>	<p>2.6.1 Demonstrate a knowledge of the development of normal refractive error in childhood</p> <p>2.6.2 Demonstrate a knowledge of abnormal refractive error and timing of spectacle correction</p> <p>2.6.3 Demonstrate an understanding of the effect of spectacle correction on disease states</p> <p>2.6.4 Consider factors influencing final prescription:</p> <ul style="list-style-type: none"> • BVD • anisometropia • amblyopia
2.7 Have a knowledge of the prescription of contact lenses	<p style="text-align: center;">**</p>	<p>2.7.1 Be familiar with different types of contact lenses and basic principles of fitting and prescribing contact lenses</p>

2.8 Have knowledge of research on slowing the rate of myopic progression in a young person	***	2.8.1 Be able to explain to a parent or carer the options for slowing the rate of myopic progression
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Context

In order to fulfil the clinical performance standards, the trainee must apply the knowledge and skills described in the:

- Ophthalmic Sciences (Anatomy, Clinical Ophthalmic and Emergency Medicine, Optics, Physiology, Clinical Genetics and Microbiology, and Evidence-based Ophthalmic Practice);
- Ophthalmic Basic Competencies and Knowledge (OBCK); and,
- Basics of Ophthalmic Surgery (BOS) curriculum standards.

Clinical practice

The following list is provided to identify the conditions, their causes and sequelae, and the treatment approaches that may be encountered by the trainee in clinical practice. The list is not exhaustive; it is intended as a guide for the use of the trainee when planning his or her learning.

Conditions deserving special emphasis

These conditions are of particular importance because of their prevalence and impact on society. It is expected that trainees will have a very detailed knowledge of these conditions.

1. Refractive errors
2. Keratoconus or any other form of irregular astigmatism
3. Amblyopia
4. Cataract or other opacities of the transparent media

Clinical Refraction Topic List

- Changes of refraction with age: acquired myopia, myopia due to nuclear sclerosis, hypermetropia and presbyopia
- Far and near point of the eye
- Emmetropia
- Ametropia
- Hypermetropia and its subdivisions: latent manifest, facultative, absolute, total
- Myopia
- Astigmatism: compound, simple, mixed, regular and irregular
- Correction of ametropia: ocular and spectacle refraction
- Anisometropia and aniseikonia
- Refractive state and genetic inheritance

- Accommodation: range and amplitude, age related values, presbyopia
- Duochrome test
- Jackson cross cylinder, Astigmatic fan and stenopaic slit
- Presbyopia correction: back vertex distance and power
- Forms of lenses: bifocals, trifocal and multifocals (manufacturing techniques not required)
- Spectacle magnification and relative spectacle magnification (simple formulae only)
- The trial case and frames
- Writing spectacle prescriptions
- Transposition
- Aphakia and its correction: spectacles, contact lenses and intra-ocular lenses
- Theory of multifocal and accommodating intra-ocular lenses (basic understanding only)
- Sun glasses
- Spectacle lens materials
- Contact lenses: trial fitting, types, over refraction and prescription