The Trailblazers
Optometry in the United States

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Contents

1. Introduction

The advancement of scope of practice for the profession of optometry in the United States can be described as bold and trailblazing. What was once a creative sidestep in interpretation of the wording of legislation in Oklahoma later became written law, common practice, admired progression, and the beginning of a new era for optometry in the USA and beyond.

Optometrists in many states of the US have a scope of practice that extends far beyond ours in Australia. They can prescribe oral therapeutics- even opioids where judiciously indicated- and "perform laser procedures excluding retina, laser in-situ keratomileusis, and cosmetic lid surgery."[1] Minor surgeries are also within the realm of appropriately trained and certified optometry practitioners (see Appendix 1).

This report will outline the main procedures included in advanced scope of practice in progressive states- especially with regards to glaucoma treatments (Selective Laser Trabeculoplasty and Laser Peripheral Iridotomy), YAG Capsulotomy, and surgical removal of benign eyelid lesions. These procedures represent the crux of expanded scope legislation being translated into common training and practice[2]. This research will examine the US states that have followed Oklahoma's exemplar and the battles they faced, as well as describing the key figures who have inspired forward- movement for the profession. The crucial aspects of further education for optometrists who practice to the full extent of scope will be investigated, and importantly, the literature regarding the safety and efficacy of advanced procedures will be summarized. The limitations of this research will be outlined, and focus areas requiring further investigation will be proposed. Conclusions will then be drawn about the benefits and risks of applying this model to Australian optometry in the future, and how advanced practice may best fit into our professional landscape.

What started as an examination of Oklahoma's optometry landscape soon became much more- advanced scope of practice is a historic movement for the profession, being championed in many US States and beyond. Australian optometrists are now standing at a clinical crossroads between comfort and evolution.

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2. *Literature Review*

Safety and Efficacy of Advanced Procedures

There is abundant clinical evidence to support the use of ophthalmic lasers to effectively treat glaucoma and ocular hypertension with laser trabeculoplasty, narrow angles prophylactically and urgently with peripheral iridotomy and posterior subcapsular opacification with YAG capsulotomy [3,4,5,6] . Similarly, the removal of chalazion and benign skin lesions through minor surgical procedures involving injected periocular anaesthetics is widely supported [7,8]. However, evidence regarding the safety and efficacy of these procedures being performed by optometrists as opposed to ophthalmologists is scarce and often inherently biased. The few studies that have followed sound clinical and statistical protocols have shown encouraging results to substantiate advanced scope[9].

Selective Laser Trabeculoplasty

The most promulgated literature regarding outcomes of advanced procedures centres around Selective Laser Trabeculoplasty (SLT), with comparatively less data available regarding other procedures. The LiGHT Study confirmed that SLT has proven clinical effectiveness, reduces the need for ongoing pharmaceutical intervention, and is an appropriate first line therapy [4,10] . It has been long established that SLT as a first line therapy for Primary Open Angle Glaucoma (POAG), as opposed to ongoing topical therapy, offers cost saving for the patient [11]. Optometrists have access to the clinical tools that optimize the treatment choice between topical or laser therapy for individual patients [12]. Several authors have reviewed the factors leading to increased success with SLT, including pre- operative IOP, surgical technique, and post- operative care approaches and reiterated the "tremendous clinical value" of this modality [13, 14]. Despite the foreseen increased demand for this treatment with time, SLT provision by optometrists is still a deeply contentious issue [15,16] .

The most renowned study that rebukes Optometry's suitability for advanced scope, entitled "Comparison of Outcomes of Laser Trabeculoplasty Performed by Optometrists vs Ophthalmologists in Oklahoma" was published in JAMA Ophthalmology in 2016[17]. This article reports a significantly greater retreatment rate in laser trabeculoplasty performed by optometrists compared to ophthalmologists. This literature requires considerable analysis as it surfaces continually in legislative debates [18,19]. In fact, reference was even made to this study as a caution to expansion of optometric scope in an Australian ophthalmic industry publication [20].

The authors, a group of ophthalmologists from the University of Michigan, employed a retrospective longitudinal cohort study of Medicare statistics encompassing 1150 services for LTP and found an increased hazard profile for retreatment amongst optometry providers (P<0.001). Over a 72-month period, 35.9% of those eyes requiring one or more subsequent service items for LTP were treated by optometrists, as opposed to 15.1% of revisits attributable to ophthalmologists. The study observed and corrected for demographic differences such as age, race, and gender, but failed to report on any specific clinical data pre- or post- operatively. In examining the item code for clinical indication for the procedure, there was great similarity between ophthalmologists and optometrists in diagnostic reasoning for SLT (POAG 86.6% of ophthalmology claims vs 89.7% of optometry claims). However, there was a 0.4% chance of need for retreatment for patients under the care of an optometrist during an initial ten- day period, and 10.3% in the 11-to-30-day post- op interval. [17] Those patients treated by an ophthalmologist had a 1.2% chance of need for retreatment beyond day 11, and zero prior. The authors did acknowledge shortfalls in analysis of retreatment figures based on Medicare claims data alone. Nevertheless, the group postulated that inadequate knowledge and training, motivations of financial gain, and inability to follow up with incisional surgery when required accounted for higher retreatment

rates by optometrists [17]. The conclusion of the piece cautioned against increased scope of practice for optometrists.

Robin further argued that optometrists' retreatment rates caused significant cost and inconvenience to patients [17,21]. Economic reasons behind the use of multiple billing instances, at certain intervals, has been discussed by Stein et al. in a negative light and omitted by Robin. Conversely, Fingeret debated that practitioners in Oklahoma at the time of this study were trained to deliver an initial 180- degree SLT and conservatively titrate the need for further treatment [22]. The ten- day global surgery period for selective laser trabeculoplasty denotes the set amount of time where further charges cannot be billed for the same treatment course, explaining why optometrists would more often delay by ten days to instigate a further 180 degrees of treatment for those patients who had not had optimal IOP reduction[23]. More importantly, adequate assessment of true IOP reduction cannot be gauged within the first 1-2 months of SLT, so secondary treatment, where necessary, was most clinically appropriate well beyond ten days [24, 25]. The majority of optometrist driven retreatments in the retrospective Oklahoma study were performed more than 2 months after the first. [17]

Despite Stein's comparative study being continually referenced in ophthalmology's opposition to expansion of scope, the clinically correct approach- single or multiple sessions of SLT treatment- has been historically debated [18]. The American Ophthalmology Association guidelines supported conservative methodology at the time, and some studies suggested complications of immediate IOP rise were more common and severe following full 360- degree treatments than 180-degree titrations [26,27]. Some contemporary studies that have investigated the impact of treating only 90- degrees of the angle have found success and safety in a conservative approach, but more sustained IOP reduction with full treatment of the trabecular meshwork has also been substantiated [28,29]. The approach to treating the trabecular meshwork has thus varied, although between 2013 onwards, a full 360- degree treatment approach in a single session became more widely employed[22].

With regards to Stein's argument that optometrists overserviced with LTPs due to their inability to provide incisional surgery, indications for this have been found to be significantly lower than a laser retreatment, and also lower following SLT than medication [3, 30]. Knowing the up- to date- clinical evidence, and being aware of implications for follow up and management, is evidently imperative to the success of expanded scope.

Future US studies with more relevant reporting on diagnosis, previous therapies, IOP reduction, complications, and quality of the procedure performed are required in order to gain a proper insight into the suitability of optometrists to obtain laser privileges in other states [22]. Professor Nathan Lighthizer and a team of optometrists from several states are currently undertaking a multi- centre prospective study of complications and success rates of SLT as performed by optometrists. Set for completion late 2021, this research will examine results from over 200 patients to provide a snapshot of post- operative IOP at 1 day, 1 week and 6 weeks, as well as reporting on the incidence and type of adverse outcomes. Australian optometrists should eagerly await and stay abreast of these findings [31].

Beyond the US, particularly in the UK, studies have more robustly compared the efficacy and safety of SLT performed by allied health professionals. A group of researchers in Scotland recently concluded that success and complication rates were comparable between Allied Health Professional (AHP) and ophthalmologist performed SLTs in an analysis of 325 eyes [9]. This prospective audit considered patient demographics and clinical data such as diagnosis and previous treatment avenues, as well as thoroughly outlining the training and service delivery protocols employed. Pre- operative IOP and post-operative IOP at 1, 3, 6, 9 and 12- month intervals were documented and compared to retrospective ophthalmologist- conducted SLT benchmarks. Chadwick et al found complication rates of 3.8% in AHP treated eyes as opposed to 3.9% in ophthalmologist treated eyes. Those complications identified were

found to be minor, often self- resolving, and comparable in nature and severity between the two treating practitioner groups. No instances of need for urgent ophthalmologist intervention in the AHP directed treatment sessions occurred [9]. The authors outlined the training and assessment of the practitioners in the allied health professional group (consisting of two optometrists and one orthoptist) and compared this directly to the standards set in ophthalmology (see Appendix 2 for results and training). 23 supervised SLT procedures were required by the AHPs to reach a level of acceptable competency before beginning patient treatment, although the supervising ophthalmologist attributed this to confidence levels rather than skill [9].

The Scottish study demonstrates clinical superiority to Stein's analysis of billing codes in Oklahoma due to a thoroughly outlined treatment protocol, matched conditions between the ophthalmology and AHP service providers, and collection of imperative pre- and post- operative data. However, randomization of patients between the two groups could provide further clinical usefulness for future comparative studies. US optometrists will undoubtedly cite Chadwick's study in legislative debates, as it demonstrates an equivalent level of IOP reduction and comparable rate of adverse effects between medical and allied health clinicians [9, 17].

In another contemporary piece of literature from the UK, the renowned LiGHT Study researchers undertook an extensive scoping study to examine the efficacy of SLT as a first line therapy when performed by optometrists [32]. This systematically examined worldwide data regarding delivery models of SLT by optometrists with the objective of proposing changes to the NHS in line with National Institute for Health and Clinical Excellence guidelines [32]. Previous studies in the UK have demonstrated the positive impact of optometry driven treatment within glaucoma clinics [33,34]. The LiGHT group review examined training protocols, clinical safety and efficacy, and public health implications of optometrist provided SLT. In highlighting the lack of evidence beyond the previously discussed articles by Stein et al and Chadwick et al, the authors of this scoping review concluded that randomised, controlled clinical comparisons between optometrists and ophthalmologists are necessary. The authors suggested that larger sample sizes should be studied with a focus on the LiGHT findings regarding laser spot size, pre- treatment IOP and disease complexity. Such data collection would allow for an up- to date snapshot of whether optometrists can achieve the same evidence- based outcomes as ophthalmologists for SLT. The authors also proposed that review of the educational foundations and economic impacts of optometrists conducting laser trabeculoplasty need to be further investigated [32].

Laser Peripheral Iridotomy

Laser Peripheral Iridotomy (LPI) is a simple and cost- effective procedure that reduces progression to glaucomatous damage in patients who are Primary Angle Closure Suspects or have Primary Angle Closure (PAC) [6,35]. LPI has been shown to have relatively low rates of complication, most of which are minor, such as temporary IOP spike, microhyphema or anterior inflammation [6,36]. Lensectomy has been shown to be more effective in preventing and treating PAC, but is significantly more invasive and complex [37].

There is currently no literature available which directly compares success and complication rates of LPI between ophthalmologists and optometrists. However, some authors have outlined that a thorough understanding of the indications and post- operative management for LPI is the most important aspect of treatment, due to the relative simplicity of conducting the procedure [16,38,39.] Detection of narrow anterior chamber angles by optometrists, a pivotal step in identifying patients requiring LPI, has been reportedly varied. Varma et al found a 1.5% incidence of undetected narrow angles in a patient population referred to ophthalmologists for cataract surgery[40]. The study involved 1229 patients and utilized multivariate logistic regression analysis of angle structures with gonioscopy, and further OCT evaluation in some patients. It is important to regard that similar rates of undetected narrow angles

were found in patients referred by ophthalmologists as optometrists. The authors also noted the implications of missing referral information in their analysis. One could argue that the design of the study was fundamentally limited, in that optometrists referring patients on for specialist opinion and surgical intervention may have avoided subjecting a patient to extra testing with gonioscopy[40].

Lee et al highlighted significant discrepancies in narrow angle detection rates between optometrists and ophthalmologists in their retrospective cohort study of an All- Payer claims database in Massachusetts between 2012 and 2015[41]. Narrow angle detection was defined through the diagnosis identified on LPI procedure codes, instead of through clinical notes regarding angle grading. The hazard ratio of narrow angle detection was found to be 46% lower in the group originally presenting to optometrists. The study controlled for the gender and age range of patients seen by each provider, however the authors acknowledged the underlying difference in patient demographics seeking care from ophthalmologists and optometrists, as well as the absence of key clinical data [41]. Patients who were identified by optometrists to have narrow angles, and referred on as such but treated with capsulotomy first instead, were not included in this data. This is significant because cataract surgery has been demonstrated as highly indicated and superior to LPI in patients with narrow angles who also have early cataractous changes [6,42] Lee et al's study also based optometrists' investigation of narrow angles around services provided in Massachusetts, a state without laser privileges, late progression to therapeutic rights, and significantly limited legislation compared to other US jurisdictions [43]. Despite this, doubt is cast upon optometrists' suitability to increase scope of practice by the authors [41].

The accuracy of optometrists' ability to diagnose occludable or closed anterior chamber angles was portrayed much more favourably in a retrospective Scottish review. Over 700 subjects who were referred to an NHS glaucoma clinic were assessed for accuracy of diagnosis according to the International Society of Geographical and Epidemiological Ophthalmology classification for Primary Angle Closure [44]. Wording of the optometrist referrals, glaucoma clinic IOPs, angle and optic nerve assessments, visual field results, and treatment pathways were taken into account in this data analysis. A Positive Predictive Value for narrow angles by optometrists was found to be 62%, and the specificity of those referred for this reason was estimated to be 76%. When patients with no suspicion of narrow angles mentioned in their referrals were included in analysis, optometrists' specificity to this diagnosis increased to 94%. The authors concluded that optometrists had a good ability to screen for and detect narrow angles [44]. Eyecare professionals have been found to have high concordance regarding glaucoma diagnoses, however consistency between ophthalmologists and optometrists regarding description of angle structures could be improved[45].

One study that did compare different clinicians' ability to successfully perform LPI based on experience level analysed complication rates between attending and resident ophthalmologists [36]. Researchers in Seattle retrospectively examined clinical notes from supervised resident iridotomy procedures on 196 eyes and demonstrated that complications were similar in incidence and nature, regardless of experience level. Severe complications, such as lasering non- iris structures (resulting in corneal damage), were extremely low in the training group at 0.005% incidence. Repeat treatments to ensure patency were no more common amongst early- year residents, but higher laser power was required by practitioners with less training [36]. This shows that seniority benefits procedure efficiency, but also that practitioners in training do not pose an increased safety risk profile for patients.

YAG Capsulotomy

Lack of evidence also exists concerning rates of success and complication for neodymium-doped yttrium aluminium garnet capsulotomy (YAG capsulotomy) performed by optometrists. This laser procedure, a fast and effective treatment for posterior capsular opacification, the most common delayed complication following cataract extraction, has been prominent since the 1980s [46, 47, 48]. Whilst many

studies explain that the need for YAG Capsulotomy will decrease significantly with time due to improvements in IOL materials and surgical techniques, optometrists in Oklahoma and other states with advanced procedures provide thousands of services per year, indicating that the current need for this treatment is significant[49]. Approximately 3.5% of post- cataract surgery patients require YAG capsulotomy by one year post op, and 8.5% by 2 years following the procedure [46].

Visual improvements following YAG are significant, predictable and well documented; but complex complications, such as cystoid macular oedema and retinal tear or detachment have been reported [47,48,50]. Case reports indicate that devastating and irreversible consequences from misuse of dual- setting YAG lasers on an SLT mode have occurred during treatment, even by experienced ophthalmology practitioners [51, 52,53.] Reduction of the common complications associated with YAG is possible through use of lower total laser energy and smaller capsulotomy sizes [46]. Most importantly, in order to avoid irrevocable macula damage, clear protocols, procedures, and attention to detail are required irrespective of practitioner profession in every clinical setting. Optometrists have long acknowledged that safety should be at the crux of advanced scope [19, 54].

One study examined access to care for patients requiring YAG capsulotomy by contrasting driving time and distance to ophthalmology and optometry service providers in Oklahoma [55]. This cross- sectional cohort study once again employed Medicare data for claims, and extrapolated patient residential data from a random 5% sample of Medicare patients. 11272 claims from 155 providers were assessed. Mahr and Erie found that there was no difference in median driving distance (39 miles to an ophthalmologist vs 46 miles to an optometrist on average) or time (47 minutes to an ophthalmologist vs 50 minutes to an optometrist) for patients regardless of whether they were treated by an ophthalmologist or optometrist. This finding casts doubt upon the often- utilised argument that more accessible and affordable care can be accessed by patients through optometrists obtaining advanced scope of practice rights[56].

Nevertheless, crucial exclusions in the data skewed the presentation of information in this case- many rural communities in Oklahoma approximate bordering states, and care provided by practitioners in adjacent states was not included in the study. Providers who claimed for less than 10 YAG capsulotomies in the calendar year were not considered, and care provided to indigenous populations through other healthcare schemes was also omitted from analysis.[55] Castillo has substantiated that access to data and formally reporting improved access to care and improved treatment outcomes in Cherokee populations has been limited by geopolitical factors.[57] The authors of the Oklahoma driving study admitted that public service route time and distance was not considered, meaning that those disadvantaged populations crucial to public health analysis were overlooked. Despite these limitations, the authors echoed Stein's concerns regarding expansion of scope.[55] Research is currently underway at Northeastern State University to present safety and efficacy outcomes of YAG capsulotomies performed by optometrists. Visual acuity outcomes and post- procedure complications will be monitored and analysed in 200 participants.[58]

In the UK, nursing staff have successfully and safely been providing YAG Capsulotomies to NHS patients for over 20 years.[59, 60] Clear objectives, training and protocols have been crucial to the success of specialised nurses, and several years later, specialised optometrists, performing YAG Capsulotomies.[59, 61] Under this system, consultant optometrists with significant experience and training in ocular disease management are certified to perform laser procedures on patients after demonstrating efficacy through a series of ophthalmologist supervised patient treatments. They then work independently to deliver laser treatment, but with ready access to the support of an ophthalmology fellow.[61, 62] This is an area of considerable interest for Australian optometrists, as this collaborative public health delivery model may be more easily adapted to our health system than the US system in which most services provided by optometrists are completely autonomous and non- hospital based. Significant further research is warranted into the provision of laser services by optometrists within the UK hospital system, as well as

ongoing review of the literature regarding the safety and efficacy of optometrists performing YAG capsulotomies.

Removal of Eyelid Lesions

The main application of periocular injectables in US States with legislated expansion of scope is in facilitating the removal of benign eyelid cysts using triamcinolone acetonide into the site, or lidocaine anaesthetic prior to incision and curettage.[7, 63] . A significant portion of the advanced procedures training in expanded scope of practice states is dedicated to this, and the surgical procedures employed for lid "lumps and bumps" removal. The main lesions treated are chalazion, verucca vulgaris, seborrheic keratosis, and squamous papillomas.[63]

Practitioners in the US are acutely aware that the highest risk associated with treating eyelid lumps and bumps is misdiagnosis of the lesion. Therefore, significant emphasis in training is placed upon ensuring that optometrists can correctly diagnose suspicious lesions and refer appropriately for specialist biopsy and management. Important but rare differential diagnoses of benign tarsal cysts such as chalazia include basal cell carcinoma, squamous cell carcinoma, sebaceous carcinoma and adenoid cystic carcinoma.[64,65,66] However, in an analysis of the accuracy of chalazion diagnosis in 1060 retrospectively studied histopathology samples from Montreal between 1993-2001, only 1.4% of cases were found to be missed malignancies. [67] The authors highlighted the imperative nature of histopathological examination of curetted material in higher risk patients, a sentiment still echoed decades later by Menon et al.[66] Nemoto et al suggested that non-invasive meibomography, a technique employed by many optometrists in assessment of dry eye, may help differentiate benign and suspicious tarsal cysts.[65] Training has also developed and adapted over time to ensure that optometrists are equipped to use novel techniques such as the removal of lesions with radiosurgical probe instrumentation.[68] This awareness of the constraints and advances in treatment options for eyelid cysts is central to the success of expanded surgical scope.[69]

Several studies have compared the efficacy of triamcinolone acetate (TA) injection and incision and curettage (I & C) for chalazion removal, with varied results.[8,70,71] In a prospective, randomized study comparing the success of TA vs I & C, with resolution being seen as 95-100% reduction in lesion size, Ben Simon et al concluded that TA was as effective first line therapy for chalazion removal as I & C.[8] The randomization of this study and clinical follow up was later queried by Norris, although Nabie et al confirmed similar efficacy of TA and I & C in their small group study.[70] In a meta- analysis spanning over three decades of randomized controlled trials, Acineyna et al concluded that in fact the success rate of triamcinolone injection for chalazion was lower than incision and curettage (60.4% vs 78%).[71]

Fat atrophy and skin depigmentation are extremely uncommon but possible and temporary consequences of TA injection.[72] Exceedingly rare complications of intralesional triamcinolone injection include central serous chorioretinopathy and corneal penetration resulting in cataract, but none of these unlikely adverse effects have been reported by optometry practitioners.[73,74] Reviewing the literature for complications arising from periocular injection with lidocaine and epinephrine yielded little results, although extremely rare cases of eyelid necrosis have been reported, once again, none of which occurred with optometry providers.[75]

In fact, there is no literature which directly compares the safety and efficacy of minor surgical and injectable procedures for eyelid lesions when performed by optometrists as opposed to ophthalmologists. However, UK studies have demonstrated great success in nurse- led minor eyelid surgery clinics, with excellent safety and efficacy profiles.[76,77] One could argue that with nurses so strongly entrusted to perform advanced procedures, such as eyelid surgeries and previously discussed

laser therapies, it should be extrapolated that optometrists, with superior knowledge of the ocular anatomy, physiology, and disease processes, would be abundantly capable.

It would be an oversight not to mention the tremendous body of research contained within the White Paper entitled "Optometry's Expanding Role in Healthcare: Assured Quality and Greater Access for Healthier Communities".[78] This report contains a significant wealth of evidence regarding cost, benefit, supply and demand analyses and public opinion surveys. However, it does not touch heavily upon safety and efficacy and has a deeply inherent pro- optometry bias. With this in mind, there is some incredibly useful information for the Australian perspective of scope expansion. The report was commissioned by the American Optometric Association and can be easily accessed online.[79]

It is imperative that further clinical studies directly compare the safety and efficacy of advanced procedures between optometry and ophthalmology practitioners, as it is obvious that the existing data is lacking and at times politically motivated. Further research should have strict protocols around the clinical environments and conditions being compared, collection of data, patient numbers and selection, and modality of data analysis.[61] This literature review has not examined the evidence regarding the full extent of scope of practice in progressive US States. Further research is warranted into the safety and efficacy of oral therapeutics prescribed by optometrists as opposed to medical practitioners, and this would be of great interest for the Australian context. A review of the literature examining the safety and efficacy of Photo Therapeutic Keratectomy, laser vitreolysis, cosmetic injectables, and novel drug delivery injections by optometrists is also imperative.

3. Then, Now, and Next: Scope of Practice In Oklahoma

Oklahoma is a state spanning more than 180000 square kilometers, with a third of its population of four million people living in rural or remote areas. Native American Indians account for 10% of Oklahoma's population. Oklahoma is bordered by other rural states- Missouri, Arkansas, Texas, New Mexico, Colorado and Kansas.[80] As well as the significant health needs of rural and remote Oklahomans, 17% of whom fall below the poverty line, rural townspeople in these bordering states often access eyecare by travelling to towns in Oklahoma due to geographic proximity.[57] This geographic and demographic background, as well as the strongly clinical focus of optometry education and practitioners in this state, made Oklahoma the initial setting of unprecedented progression in scope.[19]

The Sooner State's motto- "Labor omnia Vincit"- work conquers all- has been embraced by its optometrists. The 600+ practitioners in this state were the first to use lasers, and one of the last two states to fall to "shoptometry". In fact, legislation for Big Box retailers to sell contact lenses and spectacles only finally passed in 2019, but advocacy by the profession ensured that clinical services were separately maintained through a two- door policy.[81,82] Optometry in Oklahoma is upheld by three main entities- the University, the practitioners together with their Association, and the Board of Examiners.[83] Northeastern State University Oklahoma's College of Optometry (NSUOCO), based in Tahlequah, is a renowned and progressive institute of education and clinical services, particularly in the areas of ophthalmic lasers and surgical techniques.[84] Two of the most significant contributors to this report, Dr Richard Castillo and Professor Nathan Lighthizer, are responsible for the laser and surgical training at NSUOCO, as well as being well- published, influential leaders and educators in the field of optometry.

The Oklahoma Association of Optometric Physicians represents the interests of the profession as a "unified, organized and results driven" entity, and is strongly involved in lobbying for expansion of scope at a state and national level.[81] The passion for progression of the profession is evident in the OAOP and its presidents, current and past, who have been bold in their pursuit of expanded scope, independent optometry, and community leadership. The majority of members work within private practices, which are often located in health centre settings, or alongside ophthalmologists in surgical practices. Ophthalmology practices pursuing clinical cohesion between optometry and ophthalmology, wherein the full skill, expertise and scope of the optometrist is acknowledged and utilised, are slowly but inevitably becoming more prolific in the US.[85,86]

The Oklahoma Board of Examiners in Optometry is responsible for protecting the health and safety of the public through regulation, and has been instrumental in facilitating scope expansion in the State. Akin to the State boards in Australia, the OBEO consists of serving members appointed by the Governor, most of whom have experience in and practice optometry, and are assisted by a lay person from the community. To date, no disciplinary action has been taken by the Board in relation to the practice of advanced procedures by any Oklahoma optometrist.[1]

Overall, beyond similarities in the timing of the regulation of the profession circa 1920, Australia's scope has been roughly 20 years behind that of our most progressive US colleagues, a gap that is now increasing. The American states vary vastly in their legislature, but Rhode Island was the first to succeed in obtaining diagnostic therapeutic rights in 1971, and North Carolina initiated topical and oral therapeutics privileges in 1977, including controlled substances and injectables.[56] From this point forward, Oklahoma surpassed worldwide progression in scope with the introduction of advanced procedures through years of relentless growth.

In 1988 a handful of progressive optometry practitioners, spurred by a desire to service rural populations, attended an Academy of Ophthalmology (AO) meeting focussed on training in the use of ophthalmic lasers.[87] They then returned to Oklahoma, armed with this education and experience, and presented certification for competency in the use of lasers to the Board of Optometry. The Act at the time had no specific prohibition of surgical procedures, as was also the case for Idaho, Indiana and Washington State.[56,78] This resulted in a momentous Board decision to allow the use of lasers for anterior segment procedures by Oklahoma optometrists qualified to the level of the AO course. The

minutes of the meeting indicate that the wording of the decision was "when medically necessary, a qualified optometrist may utilize lasers, remove said stitches, and foreign bodies".[56]

The Oklahoma Licensing Board for Optometrists required reporting of any negative outcomes at this time as a way of gauging risk and benefit to patients. Thousands of laser procedures, especially for glaucoma treatment, were provided without any reported adverse outcomes during the next ten years, many of which were delivered in rural areas with limited access to ophthalmic care.[87,88] Optometrists essentially paved their own way to expansion in this first decade, without the need for lobbying or submission of bills to government.

According to many pro- optometry sources, the filing of a lawsuit by the Oklahoma Board of Medical Licensure against the Board of Examiners in Optometry coincided closely with the introduction of excimer lasers in ophthalmic practice (See Appendix 3).[49,88, 89] The Oklahoma District Court and Court of Appeals both denied the medical board rights to litigate against the optometry board. Nevertheless, these two rulings were overturned by the Oklahoma Supreme Court in 1996, leading to Judge Mathews' ruling that "the optometry Act did not authorize laser surgery and that only legislative action could accomplish this result".[79]

This inspired a grassroots lobbying campaign to ensure that in 1998, Bill 1192 reinstated optometrists' laser privileges, along with the significant language that "no entity of this state other than the Board of Examiners of Optometry to determine what constitutes the practice of optometry" (Appendix 1).

The privilege to perform non- laser surgery procedures also underwent various contests in Oklahoma. Once again sparked by a challenge to the interpretation of the optometry law by organised medicine, non- laser surgical procedures were briefly revoked, before being quickly reinstated, in 2004. The Oklahoma Association of Optometric Physicians sought clarification through House Bill 2321, which enacted that non- laser surgical procedures, as stipulated by the Board of Optometry, were allowed. The Board expediated an emergency rule defining the limitations upon allowed procedures which was then written as legislation in 2005.[90]

Cooper's in- depth summary of this history is comprehensive and clear. It is an invaluable body of work for understanding the path to increased scope of practice in Oklahoma which can be readily accessed as a part of the New Jersey Society of Optometric Physicians Handbook online.[56, 91]

Currently, around 20% of Oklahoman optometrists routinely perform advanced procedures.[2] Many of these occur in private practice settings, University clinics, and community outreach programs. Rural clinics servicing Cherokee Nation tribes, facilitated by a partnership with the College of Optometry, provide thousands of advanced procedures to patients in need each year.[84] The equipment required is as easily accessible as diagnostic imaging tools commonly employed by optometrists, and often less costly. Since 1998, over 50,000 laser procedures have been administered by Oklahoman optometrists from within the majority of the 77 counties of the State. No adverse outcomes have been reported to the Board of Examiners to date (See Appendix 4).[87]

Selective Laser Trabeculoplasty, Nd:YAG Capsulotomy and Peripheral Iridotomy are the most commonly employed laser techniques and thus form the focus of this research. Curettage of chalazion, and removal of benign papilloma, seborrheic keratosis, molluscum contagiosum, and a variety of other minor lid lesions, sometimes with the use of radiofrequency ablation (Ellman units) form a significant portion of the surgical techniques employed by progressive US optometrists. [2, 57, 69] Removed lesions are sent for pathology analysis and any lesions suspected of being more sinister in nature are referred on for treatment.[2] Treatment of trichiasis with radiofrequency ablation and occlusion of the puncta with radiofrequency cauterization are also considered an important part of expanded scope.[57, 63]

As well as the commonly practiced SLT, PI, YAG and "lumps and bumps" procedures this report focuses on, appropriately qualified optometrists in Oklahoma also perform photorefractive keratometry (PRK), laser vitreolysis, sub-conjunctival injections, and diagnostic intravenous fluorescein angiography.[92,93,94] Practitioners are also able to order an array of clinically significant diagnostic imaging, pathology and histology tests to assess conditions which may have impacts on ocular health.[95] However, these areas of

scope expansion are not explored thoroughly in this report, and further research is required to analyse the safety, efficacy, and broader healthcare system implications of these modalities being employed in optometric practice and applied to the Australian system. It is worth mentioning nevertheless that there have been two indemnity insurance claims settled pertaining to the performance of PRK by optometrists in Oklahoma, the details of which are limited due to confidentiality clauses.[96]

The wording of the laws which define scope of practice in Oklahoma are unique and forward- thinking due to the use of exclusionary language, which allows for a broad range of privileges, including the adaptation of novel techniques and technologies, without the need for constant revision.[19,97] For example, while Oklahoma's law specifically disallows cosmetic lid surgery, it does not exclude functional surgery or lid injections [83]. On this basis, some practitioners in Oklahoma, facilitated by Board assurance of their interpretation of the legislation, have continued to expand their scope to provide aesthetic solutions, including facial IPL, anti- wrinkle injectables, and therapeutic prescriptions for eyelash enhancement, to patients.[98]

Compared to other states, Oklahoma has a relatively high location quotient (meaning optometry is a fairly prevalent profession in this state), yet a relatively low average annual salary [99]. This implies that optometrists are drawn to the state because of expanded scope and professional satisfaction more so than financial gain. Clinical sub- specialisation has been shown to positively affect practice growth and success, with an average of 57% of revenue derived from patient consultations in US practices.[100] Indeed, the OAOP maintains that interest in working in Oklahoma, along with practitioner satisfaction, is overwhelmingly positive due to the progressive scope of practice.

The original proposal of this research included visiting Northern State University Oklahoma College of Optometry, The Oklahoma Association of Optometric Physicians, The Oklahoma Board of Examiners in Optometry, Cherokee Nations outreach clinics facilitated by NSUOCO, and private practitioners experienced in advanced procedures. Seeing these skills utilised in practice and participating in the hands- on elements of the Advanced Procedures courses run by Professor Lighthizer and Dr Castillo would provide further insight into the feasibility of applying these techniques in the Australian optometry landscape. Differences in medical systems, private practice settings (including equipment, referral pathways, access to care and staff training), and educational facilities between the two nations should be further investigated when international travel resumes.

4. Lay of the Land: The Evolving Role of Optometry in the United States

The disparity in scope between the different states of America leads to a unique landscape for the profession. Optometrists training at a University in one state may graduate and practice in a neighbouring state which may not allow them to utilise many of the advanced skills they have learned [85]. Whilst more states are forging ahead in attaining surgical and laser privileges, others have only recently gained the authority to prescribe therapeutics for glaucoma.[19,43] This varied picture of the profession across the nation is a reflection of the "heavily legislated" nature of optometry.[83] The fact that some bills seeking progression in scope have failed whilst others have passed is a representation of the difference in opinion that exists across state borders of government, the power of grassroots lobbying, and the often-fierce opposition led by powerful organized ophthalmology groups.[94, 101]

The maps in Appendices 5- 7 highlight the difference in scope of practice between the states.[102]

Following in the footsteps of Oklahoma, Kentucky became the second state to obtain laser privileges in 2011 under the Better Access to Eyecare Bill. Senate Bill 110 addressed laser and injectable privileges, minor surgical procedures, therapeutic advances, and the right of the Optometry Board to define the practice of optometry simultaneously and successfully.[103] The law focussed on access to care in a state in which two thirds of the counties had no access to ophthalmology practitioners, by allowing for delivery of the most clinically up to date and cost- effective treatments by optometrists.[104] Notably, PRK and LASIK were disallowed, but future laser refractive procedures could be within scope due to the exclusionary language of the Bill and the ability of the Board to oversee scope interpretation.[105] Dr Ian Benjamin Gaddie, President of the Kentucky Optometric Association (KOA), was instrumental in lobbying for the changes to scope whilst also reassuring government, the public, and ophthalmology opposers that accountability and safety remained at the forefront of the optometry profession.[101, 103] "It's not a free for all for whomever to do whatever they want" Gaddie assured as the KOA put forward a case of upholding an excellent standard of care whilst addressing public health shortfalls. As of 2020, over 40000 laser procedures had been performed by Kentucky optometrists with no increase in malpractice statistics within the state, and no adverse outcomes reported.[106] Kentucky practitioners have also stayed abreast of novel clinical techniques such as intracameral injection of an FDA approved dissolvable bimatoprost drug delivery system.[101, 107]

Louisiana followed with laser privileges in 2014, a year of progression in therapeutics rights for Arizona, Nebraska and Tennessee.[108] Similarly to Oklahoma, Kentucky, and the states that have followed since, the Louisiana legislation, Act 398, allowed for expansion of scope for those optometrists who underwent further training and certification. As of 2020, 298 of the practising 498 optometrists in Louisiana have undergone extra training and accreditation to provide advanced procedures, with new graduates required to be licensed to the highest level of scope.[49, 109] In just three years between 2015-2018, 11545 laser procedures were performed by ODs in Louisiana with zero negative outcomes reported, and no malpractice suits were brought forward relating to advanced procedures.[109] Dr Chris Wroten, a fundamental figure in Louisiana's battle for increased scope and a prolific advocate and educator in optometry, has described the exclusionary language of the Louisiana Act 398 as "inherently adaptable" and highlighted the Board's resulting ability to embrace novel advances, technologies, and medications to benefit provision of eye care of the best standard.[49, 110]

Alaskan optometrists achieved the ability to provide laser and minor non- laser surgeries, as well as regulating their own levels of practice, in a House Bill which according to one of the representatives sanctioning the legislation "allow(ed) optometrists to get on with the business of providing appropriate and safe eye health care for all Alaskans".[111] There have since been no reported adverse outcomes of Alaskan optometrists gaining advanced procedures rights.[112] Despite significant challenges, Arkansas rounded out the first five states to attain laser privileges in 2019 whilst California, Iowa, West Virginia

and North Carolina forged ahead with pharmaceutical privileges, including the provision of some injectables and fluorescein angiography over the following two years.[113, 114, 115, 116,117]

Vermont Optometric Associations' (VOA) unsuccessful attempt to expand scope of practice laws in a 2019 legislative session represents an interesting case study of how behind the scenes lobbying and influence can affect jurisdictive outcomes. Due to fiercely opposing views put forward by the VOA and the Vermont Ophthalmological Society (VOS), the Office of Professional Regulation OPR) in the state was tasked with investigating approaches to advanced procedures, patient needs for access to care from optometrists, the effects on patient safety that would result from expanding optometric scope, the existing training for advanced procedures, and the costs to the healthcare system.[118] The VOA application, from afar, can be assessed as too broad, and on the surface, it appears that there were shortfalls in the responses to the OPR process, especially with regards to reassurance over education syllabus from the 21 schools of optometry approached.[117] This left a gap in opinion regarding the safety of optometrists performing laser and minor surgical procedures, doubt over the public need for expanded scope, and uncertainty over whether the measures would be cost saving.[118] Sources from within optometry scope advocacy groups argue that the university groups responded as a whole, that limited time was given to optometry groups to provide proper documentation supporting the proposal, that some evidence regarding the safety and efficacy of scope was submitted but overlooked, and that ophthalmology groups had strong influence amongst decision makers [49, 57, 117]. The power of lobbying, on either side of a proposal to advancement of scope, cannot be underestimated.

This year, the ground swell of change within optometry has been formidable. Since the drafting of this report in early 2020, three further states in the USA have obtained laser and surgical scope of practice expansions. Wyoming House Bill 32, passed in April this year, was the result of passionate optometry lobbying that included practitioners demonstrating their skill using laser equipment to local legislators in a travelling grassroots laser "roadshow" [119]. This success came shortly after Mississipi's victory with House Bill 1302 in March 2021, and Idaho's successful laser legislation House Bill 317 a year prior [120], [121]. Legislature for expansion of scope in Texas is underway while similar proceedings in Alabama have been adjourned [122], [123]. This recent momentum was gained from a report prepared for the White House to assess shortfalls in inefficiencies in the healthcare system, which referred to the ability of "optometrists to effectively provide some of the same healthcare services as physicians" [124], [125]. The profession also rallied to increase public access to COVID 19 vaccinations in a country ravaged by high infection rates, with ODs in 8 states gaining legislative privileges to administer vaccinations [126].

The contributors to this research who have been involved in supporting legislative changes for the profession have overwhelmingly asserted that education of practitioners, organised lobbying, well thought out and presented proposals, and perseverance are crucial to successful attempts for progression. Expecting some requests for expansion of scope to be denied and others to undergo significant compromise is recognised as a necessary political casualty of dealing with strong opposition [49, 57]. Strong, calm, passionate leaders in optometry have been shown to have positive effects on legislative change [49, 101].

Legislative battles for expansion of scope within the US have often become controversial and divisive, at times sparking conflict and causing damage in the crucial relationship between optometry and ophthalmology [123], [127]. As an insight into opposing opinion, the minutes of the American Academy of Ophthalmology All Regions Meetings and the AAO Advocacy page are worthwhile resources [115, 128].

There is significant shortfall and emerging bias in this element of the report regarding legislative change in the US due to insufficient evidence from ophthalmology representatives. However, this was not from lack of endeavour. Invitations to several overseas specialists opposed to the expansion of scope of practice in optometry were not answered, and these ophthalmology representatives could not

be contacted for input. Further time and effort should be invested into gathering balanced perspective in future research, so that Australian optometrists can understand and work collaboratively with those of the opposing perspective.

5. Pivotal People: Key Figures and their Contributions

Optometry Australia's most valuable resource in researching expansion of scope is undoubtedly the overseas colleagues who have pioneered and perfected such change in the profession. The following notable colleagues have provided crucial information, support, and encouragement in this research.

Professor Nathan Lighthizer

Professor Nate Lighthizer completed his OD qualification at the Pacific University College of Optometry in 2009, followed by a residency in Family Practice Optometry specializing in Ocular Disease at NSUOCO in 2010. He has since been an eminent and influential voice for optometric scope progression. His role as Associate Dean and Chief of the Speciality Care and Electrodiagnostics clinics at the College of Optometry in Oklahoma encompasses teaching and mentoring students in laser procedures, office-based surgical procedures, and contemporary technologies. As President of the Intrepid Eye Society, Professor Lighthizer is a renowned provider of quality continuing professional education, and has been recognised as an innovative thought leader in optometry as an inductee to the Primary Care Optometry News progressive (PCON) 300 list [129], [130].

Professor Lighthizer is a valuable source of information regarding the history and implications of expansion of scope in Oklahoma and how advanced procedures are implemented in everyday practice by optometrists in this state. Australian optometrists should eagerly follow his clinical trials examining the efficacy and outcomes of laser procedures performed by optometrists [31, 58].

Professor Richard Castillo, OD, DO

Professor Castillo provides the ultimate support to expansion of scope arguments from his unique perspective as an optometrist and ophthalmologist. This year's recipient of the Arkansas Optometric Association's Award for Outstanding Service to the Association and Profession of Optometry, as well as a special citation from the Oklahoma House of Representatives for his contribution to the advancement of surgical eyecare, Professor Castillo has provided a powerful voice substantiating the abilities of optometrists. In addition to his role as NSUOCO's Chief of Surgical Services and principal surgeon, he is a consultant surgeon in Oklahoma health services and a vital contributor to National Board of Examiners in Optometry standards and procedures. Professor Castillo completed his OD qualification at Northeastern State University in 1987, before undertaking his medical studies, obtaining a DO at Oklahoma State University and residency in ophthalmology and ophthalmic surgery at OSU's Department of Ophthalmology [84].

Professor Castillo is well versed in legislative debate and expansion of scope strategies. His insight into what surgery is within the realm of optometric practitioners, and what surgery should truly lie within the scope of ophthalmology specialists, is unique and valuable. He accentuates the importance of speciality specific curriculum, general public understanding of different types of surgery, and evidence-based standards of care.

Dr Ian Benjamin Gaddie

Dr Ben Gaddie is a prominent optometrist in Louisville, Kentucky, where he directs a multi- group practice offering laser procedures such as YAG, PI and SLT. As former President of the Kentucky Optometrists Association, and once a recipient of their Optometrist of the Year Award, Dr Gaddie was instrumental in ensuring expansion of scope in his state. Having obtained his Doctor of Optometry from the University of Alabama-Birmingham, Dr Gaddie completed a residency in Ocular Disease through NSUOCO. He is currently President of the Optometric Glaucoma Society and an inductee to the PCON 300 list [130].

Dr Gaddie's composed presentation of the merit of optometric advanced scope practice is perhaps the most publicized debate on the topic, appearing on Kentucky Tonight in 2011 alongside Oklahoma optometrist Dr David Cockrell, who also contributed to this research. Dr Gaddie's arguments supporting the education, training, and clinical abilities of optometrists still hold today, a decade on. This episode

provides invaluable insights into the complexities around legislative change for optometry in the US, and can be viewed at https://www.ket.org/program/kentucky-tonight/eye-care-services/.

Dr Gaddie provided crucial insights into the day- to- day implications of expanded scope in practice, the importance of robust engagement with the public and legislators, and maintaining strong relationships and effective co-management with ophthalmology colleagues.

Dr Christopher Wroten

Dr Christopher Wroten is a partner and coordinator of residency programs at the Bond- Wroten Eye Clinics in Louisiana. He has twice been elected as the President of the Optometry Association of Louisiana and is the current co-chair of the Legislative and Education Committees for the state. He had an instrumental role in advancing scope of practice in Louisiana, having already qualified to perform laser procedures and minor surgeries in other states. Dr Wroten is an adjunct professor to three schools of optometry in the US, and serves on the Louisiana State Board of Optometry Examiners and the American Optometric Association's Federal Relations Committee. He performs over 100 laser procedures per year in private practice.

Dr Wroten is incredibly knowledgeable across multiple aspects of expansion of scope and outcomes of advanced procedures by optometrists. He provided vital resources regarding reported outcomes and a detailed account of historic steps towards progression in the US. Dr Wroten's insight on shortfalls in some of the available literature and inside perspective on Vermont's unsuccessful steps towards legislative change in the profession were invaluable. He explained the importance of training and rallying first, and having a patient- centric objective of the benefits of optometric scope expansion.

Dr Karl Stonecipher

Dr Karl Stonecipher is a consultant ophthalmologist and medical director of the TLC laser eye centre in Greensboro, North Carolina. He has been a supportive colleague for optometrists obtaining laser and minor surgical procedures in various states. Specialising in anterior and cataract operations, Dr Stonecipher has performed over 77000 laser refractive surgeries since his certification as an ophthalmologist in 1992.

Dr Stonecipher explained that his Physicians Assistant and Ophthalmic Nurses were able to perform, on a daily basis, the kinds of minor procedures that optometrists in the US have spent many years lobbying for. He said common arguments from ophthalmology colleagues were based around medical training being fundamental to surgery, but that in fact most MDs had very little knowledge of ocular disease and how to utilise the instrumentation to properly diagnose and treat it. Therefore, his support of optometry colleagues came from a belief in the training and skill obtained in the OD and Advanced Procedures courses, coupled with extensive clinical experience. He admitted that increased scope of practice for optometrists meant that his time was largely dedicated to more efficient consulting and most importantly, performing more complex surgery. He has never witnessed or needed to manage complications from optometrists performing laser and minor surgical procedures. However, when questioned about complications, Dr Stonecipher made the important point that no practitioners- optometric or ophthalmic- are immune to incidents of complications occurring in some patients. He stressed that understanding and properly managing possible complications of any procedure was at the crux of good practice.

Dr Melanne Rosetta

Dr Melanne Rosetta is an Australian optometrist who graduated from Queensland University of Technology in 2006 and practiced in Western Australia. She is now a registered optometrist in the US, having completed a Doctorate of Optometry at New England College of Optometry and her residency in Ocular Disease and Ocular and Refractive Surgery at Salus University. Dr Rosetta specialises in glaucoma surgery co-management.

Dr Rosetta is an instrumental source of information and support for Australian optometrists considering expansion of scope. She gave a detailed account of the variation in training and practice in the different states of the US, and explained that she will soon attend an Advanced Procedures workshop to obtain laser and minor surgery credentials, even though she is not currently able to implement such techniques in practice in New Jersey. Dr Rosetta is currently undergoing American Board of Optometry certification and undertaking a Fellowship of the American Academy of Optometry.

Dr Rosetta explained that she was armed with the knowledge and ability to manage the extra complexity encountered in her work in a renowned ophthalmic practice through the education and experience gained in her Australian degree, her OD course, and most significantly, her residency year.

Dr David Cockrell

Dr David Cockrell, an Oklahoma optometrist and private practitioner, has provided influential advancement of scope advocacy in the US throughout his career. This was sparked through his role as President of the American Optometric Association (AOA) in 2014, where he maintained focus on advancement for the profession, and continued as the AOA State Government Relations Centre, where he helped state affiliates pass scope of practice legislation[131]. Having obtained his OD from Southern College of Optometry in 1981, Dr Cockrell has given testimony at several Senate subcommittee hearings regarding optometric scope legislation, increased public awareness on the role of optometrists as primary eyecare providers, and served on the Board of the AOA.

Dr Cockrell has stressed the importance of optometrists expanding scope in order to better serve an ageing population and the accompanying increase in ocular disease [132]. He has implemented his 40 years in practice in Oklahoma, along with his seasoned experienced with advanced procedures, to assist other states in succeeding to gain laser, injectable and minor surgical procedures. He can provide optometrists in Australia with a wealth of knowledge regarding both the practical aspects of expanded scope, as well as the organisational efforts involved, and keys to successful advocacy.

Evgenia Konstantakopoulou

Dr Evgenia Konstantakopoulou is a research optometrist from Moorefields Eye Hospital, who was contacted for further insight into her research regarding optometrists conducting laser treatments in the UK hospital system. She is renowned for her contribution to the LiGHT Study which has revolutionized treatment approaches in Primary Open Angle Glaucoma.

Dr Konstantakopoulou explained that evolution in scope in the UK has occurred not through legislative change, but by training a specialised subset of optometrists working in ocular disease clinics through the NHS. This was initiated because trained nurses were allowed to perform SLT, PI, and YAG capsulotomies, and research indicated that the role of optometrists in glaucoma care clinics could be expanded similarly. She described the well- controlled environment in which practitioners in the UK are trained in these clinical skills, with expertise in diagnosis being an essential foundation to further supervised training in laser procedures. Whilst the hospital system has clear guidelines for the performance of these procedures and appropriate follow- up care, there is still some uncertainty regarding indemnity coverage. Dr Konstantakopoulou said that legislative change could better protect those specialised optometrists providing crucial laser treatments.

The benefits of optometrists providing these therapies in the UK has been substantiated by well-presented clinical data. Dr Konstantakopoulou, who has been heavily involved in this research, is an invaluable source of information regarding the impact of good quality clinical evidence in supporting changes in scope, and forward steps that have been made increasing optometrists' role within specialised clinic in the public health system.

Several US ophthalmologists, who have been strongly opposed to expansion of scope for optometrists, were contacted for balanced perspective. However, at this stage there has been no response. Further research should invite ophthalmology opinion both overseas and at home.

6. Setting the Scene: Education and Training for Advanced Procedures

Optometry in the United States, like Australia, is a profession with minimum education requirements and Board endorsement for registration. American optometrists complete an undergraduate degree before applying to study the Doctor of Optometry (OD), a four- year, doctoral level degree. The process of applying to one of the 23 schools of optometry nationwide involves meeting prerequisite learning requirements in science and mathematics subjects, passing a specialised admissions test, and submitting an application complete with personal biography, recommendations, employment history, and an essay [133]. Whilst the OD programs are largely similar to the degrees offered by Australian schools of optometry, ophthalmic applications of lasers and minor office- based surgical procedures are an integral focus of the clinical coursework at some universities [84]. After completion of the OD course, some optometrists enter residency programs in specialised areas such as ocular disease, refractive surgery, primary eyecare, cornea and contact lens, and low vision. These programs allow for further depth of knowledge and extensive clinical experience in the chosen areas of expertise [84, 85].

At least 15 colleges of optometry in the USA offer advanced procedures education as a part of the OD program, a number which is constantly increasing with revision of curriculum to align with expansion of scope [134,135]. Northeastern State University College of Optometry, in Tahlequah Oklahoma, is the preeminent education provider for advanced procedures in the USA. Not only are ophthalmic lasers and advanced procedures covered in the OD program at NSUOCO, but the College is Internationally renowned for its postgraduate Advanced Procedures intensive program. Coordinated by Professors Nathan Lighthizer and Richard Castillo (one of the original creators of the course), the Advanced Procedures curriculum consists of 32 hours of theoretical, practical and self- study modules focussing on anterior segment laser procedures and minor surgical procedures. It is conducted twice annually from the Tahlequah campus, and throughout several states of the US as a "roadshow" training and endorsement pathway for optometrists wishing to expand scope [2, 57, 136].

Virtual attendance of the theoretical component of the Tahlequah course formed a vital part of this research. The course content was engaging, complex, and well presented (see Appendix 8). The lectures, held in Tahlequah in January 2021, contained information at a level that could be easily grasped with an Australian optometry degree and clinical experience. In a delivery model comparative to postgraduate Ocular Therapeutics courses offered in Australia, it built upon proficient optometrists' knowledge of anatomy of the eye and adnexa, physiology, pharmacology, and disease aetiology. Spanning an intensive weekend, the Advanced Procedures seminars closely examined the main clinical indications, contraindications, differential diagnoses and aligning treatments, pre- and post- operative care, clinical red flags, and expected outcomes for the main legislated procedures in expanded scope in certain US States.

Dr Richard Castillo's lectures extensively covered differentiating lid lesions and emphasized the importance of referring those with suspicious markers first and foremost. The anatomy of the lid, characteristics of different lesions, and the potential pathway for dysplastic cells to progress from metaplasia to carcinoma were reviewed in detail. Dr Lighthizer conducted interactive rounds challenging participants to differentiate common lesions and identify appropriate treatment approaches. One main concern of opponents to optometrists performing minor lid surgeries has been misdiagnosis of lesions and inappropriate treatment for potential malignancies[137]. Attending this course demonstrated that optometrists with Advanced Procedures accreditation would be equipped with abundant knowledge of this risk and the ability to pertinently manage or refer lid lesions. The importance of diagnostic biopsy was strongly emphasized throughout Castillo and Lighthizer's lectures.

Appropriate use of anaesthetic lid injections in preparation for minor surgeries and the risks involved form a significant part of the Advanced Procedures coursework. Techniques for successful chalazion curettage, lid suturing, biopsy and radio surgical probe use were explored in detail. The pharmacology,

actions, and contraindications of anaesthetic drugs was reviewed and clinical approaches to possible adverse reactions were addressed.

The ophthalmic lasers theory strongly focussed upon the various forms of glaucoma and identifying cases suitable for, and responsive to, management with Peripheral Iridotomy and Selective Laser Trabeculoplasty. Angle structure, different anomalies, and tissues characteristics were reviewed in detail. The importance of good gonioscopy skills was accentuated before the physics of lasers and the risks and benefits of different laser procedures were explored. Pre- operative examination and assessment, technique, and potential complications for SLT and PI were thoroughly discussed by Professor Lighthizer. In this section, the indications, contraindications, risks and follow up protocol for YAG Capsulotomy were also covered. For each procedure, the clinical evidence was presented as well as analysis of laser settings and presentation of various ways to approach treatment i.e., full vs incremental SLT; cruciate, horseshoe, circular, or spiral YAG patterns.

Practical, laboratory -based training in minor surgical procedures, injections, biopsy, use of radio surgical probes and laser procedures is a crucial element of the NSUOCO Advanced Procedures course. Attendees are instructed, assisted and then observed independently performing a range of procedures using state of the art model eyes. Simuleye ophthalmic surgical training models are implemented, the design of which are consistently refined through collaboration with optometrists at the forefront of training in Advanced Procedures [2] ,[57].

In terms of accreditation, the Board of each individual state stipulates the requirements of practitioners to perform advanced procedures treatments such as SLT, LPI, YAG and minor lid surgeries according to their legislation[138]. The National Board of Examiners in Optometry overseas endorsement of optometrists to utilise advanced procedures[139]. In a similar way to therapeutics endorsement for experienced Australian optometrists undertaking a postgraduate course, the examination is conducted as part of the NSUOCO course. Alternatively, optometrists in the US can complete the Laser and Surgical Procedures Examination at the National Centre of Clinical Testing [139]. Assessment of practitioners' capacity to practice with laser and surgical privileges involves theoretical and practical examination. A computer- based series of 50 questions comprises the theoretical assessment, whilst the practical exam evaluates performance of YAG capsulotomy, Selective Laser Trabeculoplasty and Peripheral Iridotomy on model eyes. The surgical component of the exam includes theoretical questions and practical assessment of suturing and chalazion curettage [57].

In Kentucky, the Board stipulates that practitioners seeking endorsement to use ophthalmic lasers in practice must have completed these education and examination requirements, and in addition, be deemed as proficient in advanced scope techniques by an ophthalmology preceptor. This extra requirement consists of performing therapeutic laser techniques such as SLT, YAG and PI on a live patient in the presence of the ophthalmology preceptor, a clinician of good standing who is associated with a tertiary optometry or medical school [138]. UK models of laser implementation have revolved around optometrists being trained, supervised and accredited by ophthalmologists within a hospital setting [61]. Resources and protocols for laser use are becoming more accessible to optometrists internationally thanks to the collaborative efforts of renowned optometry and ophthalmology experts [140].

In order to pursue scope expansion in Australia in the future, attendance of the practical aspect of the NSUOCO course by Australian representatives in person is imperative. Canadian and UK optometrists have an established history of attending and benefiting from the Advanced Procedures workshops hosted by Professors Lighthizer and Castillo, with Canadian groups travelling to Tahlequah for over 15 years to attend [57]. In June 2019, an innovative "roadshow" course was taken to the province of Alberta, Canada where approximately 100 Albertan optometrists were fully trained and certified on Advanced Scope procedures. A second offering of the course was scheduled in 2020, but was postponed due to Coronavirus pandemic travel restrictions. This 2nd course will now likely be offered sometime in 2022 [140]. Australian attendance would allow for an accurate appraisal of the skill, time, and dedication

required by practitioners to become proficient in the clinical techniques required for various laser treatments and minor surgical procedures. It would also provide an invaluable opportunity for international networking, further perspective on costs and benefits (to patients, public health, and practitioners) and strategic support for Optometry Australia's objectives.

7. Looking Ahead Down Under: Advancement of Scope in Australia

Kekevian described optometry as a profession "constantly redefining itself" [141]. The most imperative outcome of this research has been that Australian optometrists must continue to progress and adapt in a rapidly evolving international professional climate. Failure to rally for expanded scope would inevitably result in being left behind world standards of practice, and failure to meet the health demands of an ageing population. It has been found that higher scope of practice in optometry, and increased numbers of optometrists practising, both lead to lower levels of vision impairment and blindness [142]. Australian optometrists can ensure that this correlation is exemplified.

Recent data projects a significant shortfall in ophthalmology supply by the year 2030, and an oversupply of optometrists in Australia by 2036 [143],[144]. A Department of Health Report into Australia's Future Health Workforce assessed shared care models between ophthalmology and optometry and concluded that "patients benefit through accessible, high quality eye care and timely follow-up, thereby reducing the risk of adverse consequences of chronic diseases." The shared care models currently in place for glaucoma, macula degeneration, and diabetic eye disease have not slowed growth in services for either profession- in fact, these measures are only just allowing both professions to cope with the demands of an ageing population. Over the next decade, ophthalmology's ability to keep up with population eyecare needs will decline, whilst optometry will have extra capacity to assist [143]. Optometrists and patients would benefit from diversification, with some clinicians who are content with current standards to continue practicing as primary providers in community settings, and others being enabled to embrace the full breadth of their knowledge and skill through increased scope and specialisation.

Advances in scope must first and foremost benefit the health and safety of patients, bring improvements in efficiency and access to eyecare services for the public, and ensure that the increasing supply in optometrists can be best utilised to meet healthcare needs. The following key recommendations have emerged through researching Oklahoma's scope. These recommendations reflect advice given by influential US optometrists regarding the cornerstones of sparking successful change-

- Establish goals that are in the greater good
- Rally for widespread support
- Ensure proper clinical education
- Gather data and evidence to substantiate the ability of optometrists to perform at extended levels of scope [2, 49, 57, 101].

Establishing Goals

Identifying areas of need for future scope expansion has already begun through the imperative report Optometry 2040 [145]. This report demonstrated that expanding scope of practice in Australia will follow some similar paths, and in other ways look vastly different to the main objectives of legislative changes secured by American optometrists.

1. *Oral Therapeutics*

All US States that have laser and injectable rights have previously or simultaneously obtained oral therapeutics prescribing rights, a steppingstone which makes fundamental clinical sense and is highlighted as a key objective in Optometry 2040 [2], [145]. Optometrists in Australia are now over 15 years behind the majority of US States which are legislated to prescribe oral therapeutics, despite many aspects of the educational framework being comparable [146], [147]. Therefore, obtaining rights to prescribe oral therapeutics, particularly for ocular conditions such as preseptal cellulitis, ocular rosacea, and herpetic eye disease, should be considered an initial step in expanding scope of practice in Australia[148]. Further research should imminently examine the safety, efficacy, and public health implications of oral

therapeutics being prescribed by Australian optometrists, as well as identifying a pharmaceutical "wish list" based on clinical and patient needs.

2. *Injectables*

This report has demonstrated that the primary use of injectable drugs by optometrists in Oklahoma and other US states is for periocular procedures, particularly for minor lid surgeries [69, 149]. This is purely reflective of limitations in the legislature which restrict intraocular injections [1]. Advances in scope for Australian optometrists should aim to avoid such restrictions to intraocular injections in light of public health needs and the opportunity for collaborative care models with ophthalmology colleagues[150].

The main application of ocular injections in Australian eye care, and the costliest drugs to the Australian government overall, are intravitreal anti- VEGF therapies [151, 152] (See Appendix 9). The increasing need for anti-VEGF treatment in the population, and the ongoing nature of treatment, create wide- ranging burdens upon patients and the healthcare system [153]. Resultingly, RANZCO is currently devising guidelines to train non- ophthalmology health professionals to deliver intravitreal anti- VEGF treatments [154]. Optometrists should be at the forefront of this improved pathway to imperative care for patients with macula disease [150].

It is critical that Australian optometrists work alongside specialist colleagues to establish and undergo appropriate training, and enact upcoming RANZCO protocols for delivery, as OA have proposed [150]. It has already been demonstrated in various models abroad, especially in the UK and New Zealand, that ophthalmologists can aptly train nurses and optometrists to safely administer anti- VEGF therapies to patients [61, 155]. Such models could be applied in Australia through supervised care in public hospital ophthalmology units [152, 155]. Significant further research is required into systems of care in the UK, New Zealand, and other nations so that Australian optometrists are informed and prepared to assist in delivering intravitreal treatment for preventable blindness. Such research should address the establishment of care models, the protocols in place, the training and certification process, and the safety and efficacy of optometrists delivering this invaluable care. Optometry Australia should build upon their current work in this area as well as collaborating with ophthalmology colleagues and public health representatives to increase optometrist presence in hospital eye clinics.

Injectables for minor surgeries, such as those used in the US scope context, are less urgently needed in Australia due to the lower severity of the clinical problems treated (i.e., chalazion). Nevertheless, the ability to perform lid biopsies and remove benign lesions, especially in rural and remote areas, would increase access to care for patients and reduce burden on ophthalmology colleagues whose skills would be best utilized treating more serious cases. The realm of functional lid injections, especially with regards to cosmetic anti- ageing treatments, may allow for further diversification of the optometry workforce, and follow in the steps of other allied health professionals with such privileges. Whilst such a move would appeal to patient demand, there would be limited benefit in terms of public health.

3. *Ophthalmic Lasers*

This research has found that optometrists can safely and capably utilise ophthalmic lasers to treat glaucoma and are aptly skilled to perform YAG capsulotomy [32]. Further clinical evidence to substantiate this should emerge over the next year [31, 58]. Over decades of laser use, optometrists in Oklahoma have an excellent track record of providing treatment without adverse outcomes or increased indemnity claims. These treatments have improved access to care, reduced patient waiting times, lowered public health costs, and properly utilised optometrists' skills [2, 49, 57, 78]. Models of in- hospital laser therapies by nurses and optometrists in the UK have delivered clear clinical signs of efficacy and safety [9, 87, 106].

Analysis of Medicare billing claims over a ten- year period demonstrated a "dramatic" increase in Selective Laser Trabeculoplasty and Laser Peripheral Iridotomy demand in Australia[156]. The increased need for these crucial services has occurred despite the introduction and popularity of novel glaucoma advances such as MIGs (Minimally Invasive Glaucoma surgery), possibly as a result of the overwhelming evidence from the LiGHT Study in combination with population demographics[3, 156]. The instruments

required to make these proven laser treatments more accessible to patients in need, especially those in regional and remote areas, are easily attainable. Optometrists have the clinical ability to be easily trained in the skills required [2,61].

The literature validating the efficacy and safety of YAG Capsulotomy by optometrists is not as widely publicized. However, overseas colleagues stress the importance of access to care for patients requiring this procedure, and the significant improvement in visual acuity that it provides is well proven [47]. The simplicity of YAG Capsulotomy and the vast demand for it mean it is an imperative area of scope expansion for Australian optometrists into the future. Australian optometrists should stay abreast of research regarding the safety and efficacy of the procedure by optometrists in the US, and increased integration of this technique by optometrists in the NHS.

Australian optometrists should consider scope expansion in the use of lasers for Selective Laser Trabeculoplasty, Peripheral Iridotomy, and YAG Capsulotomy into the future.

Rallying Support

Several prominent US optometrists have emphasised that a fundamental concept of gathering support amongst the profession for expansion of scope is posing the question "even if you yourself, as a practitioner, do not wish to use these skills, do you consider some of your colleagues capable and willing to do so?" [49, 57, 101]. This ensures that optometrists who would otherwise be silent and unengaged in debates around scope changes may be encouraged as passive supporters. After decades of modelling the use of lasers and minor surgeries in optometric practice in Oklahoma, it is now accepted as a part of primary care, instead of expanded scope [57]. At this moment in time, Optometry Australia is in the unique position of RANZCO having made the first step towards change with regards to anti-VEGF treatment by non- specialist practitioners, and therefore the Association on behalf of members has already begun important work to step into this space [150, 154]. Increasing practitioner awareness of the responsibility towards embracing this change is now crucial. Propagation of proposed frameworks to members, increasing public knowledge around optometrists' abilities, and lobbying government representatives in early stages is imminent. Similar rallying should occur in time with regards to oral therapeutics, laser privileges, and minor surgeries.

The Australian political landscape is quite different from the US system. Individual lobbying with state representatives has been a pivotal aspect of instigating legislative change in American states with advanced scope [2]. Whilst there is no doubt that individualized Lower House and Senate support for optometry would further any cause for increased scope, Australian changes have historically occurred through the Association increasing public awareness, negotiating with ophthalmology representatives, and lobbying health ministers on behalf of practitioners [154].

Ensuring Proper Clinical Education

Vermont's failed application for expansion of scope into the realm of lasers and minor procedures demonstrates that the foundations of education must be clearly established and consistently correlate with the minimal standards for further clinical endorsement [118]. Australian optometry educators have exemplified a unified approach to change degree programs to reflect therapeutic endorsement requirements, and are aptly prepared to do so in other realms of scope expansion [157]. Following an initial phase focussed on intensive postgraduate coursework and training, similar amendments to degree structure could occur with legislative change for oral therapeutics, injectables, and laser privileges in the future. Continuing Professional Education resources should now be strongly focussed upon embracing the theory and practice of advanced procedures.

The first imperative step in ensuring proper educational programs for increased scope of practice in lasers and minor surgical procedures would be for a group of representatives from Australia to travel to the US to meet colleagues in Oklahoma, attend the Advanced Procedures course, and observe the procedures performed in everyday practice [2]. This group could then devise educational aims and create courses to be offered in each state and territory. US Colleagues should also be invited to national conferences to facilitate training similar to that offered at NSUOCO in order to proliferate these abilities

to the majority of practitioners. Renowned practitioners have emphasized the importance of proficient gonioscopy in performing laser procedures for glaucoma treatment, so although Australian optometrists already have excellent skill in this area, CPD courses and workshops could immediately include this focus in the interim [61].

As a way of executing the above steps towards expansion of scope, an Advanced Scope Advisory Committee should be established consisting of members of the OA, experienced optometrists from around Australia, educational representatives, and if possible, supportive ophthalmologists.

8. Conclusion

The changes sparked by forward- thinking optometrists in Oklahoma decades ago have allowed for increased access to fundamental treatments for patients and progression in the profession far beyond that state. Practitioners in some parts of the US have now been using lasers to perform Selective Laser Trabeculoplasty, Peripheral Iridotomy, and YAG Capsulotomy for over two decades. Through this time, optometrists have been also performing minor lid surgeries with the use of injectable anaesthetics and diversifying their clinical skills into novel techniques to meet patient needs.

Advancement of scope in a growing number of US states has encouraged progressive post-graduate clinical education, increased public awareness of optometrists' abilities, and optimized utility of the workforce. Further research will better substantiate the safety and efficacy of such procedures being performed by optometrists with well- controlled clinical protocols. However, the evidence gathered through extensive conversations with international colleagues, review of current literature, and investigation of differing optometry landscapes has well and truly supported the benefits of America's expanding scope, for patients and practitioners.

Continued collaboration with those who have graciously and invaluably contributed to this report is encouraged, and the areas of further research that were identified through this research should be addressed.

Although the imminent eye care needs of an ageing Australian public may mean that optometrists here need to approach expansion of scope in a slightly different way to our American colleagues, the end result should be the same- a profession ready, equipped, and trained to meet the needs of those we serve with optimised skill and scope.

9. Appendices

Appendix 1: Excluded non- laser surgical procedures [1]

Title 505: 10-5-17. Proper scope of practice of nonlaser surgical procedures

(a) The practice of optometry is defined to be the science and art of examining the human eye and measurement of the powers of vision by the employment of any means, including the use or furnishing of any self-testing device, the use of any computerized or automatic refracting device, the use of pharmaceutical agents, the diagnosis of conditions of the human eye, and the correcting and relief of ocular abnormalities by means including but not limited to prescribing and adaptation of lenses, contact lenses, spectacles, eyeglasses, prisms and the employment of vision therapy or orthoptics for the aid thereof, low vision rehabilitation, laser surgery procedures, excluding retina, laser in-situ keratomileusis (LASIK), and cosmetic lid surgery. (59 O.S. § 581) In addition, the practice of optometry shall include the correction and relief of ocular abnormalities by Non-Laser Surgical procedures not excluded in paragraph (b) of this rule.

(b) Except for the Post Operative Care of these procedures, the following Non-Laser Surgeries are excluded from the scope of practice of optometry:

(1) Non-Laser Surgery related to removal of the eye on a living human being;

(2) Non-Laser Surgery requiring full thickness incision or excision of the cornea or sclera other than Paracentesis in an emergency situation requiring immediate reduction of the pressure inside the eye;

(3) Penetrating Keratoplasty (Corneal Transplant), or Lamellar Keratoplasty;

(4) Non-Laser Surgery requiring incision of the Iris and Ciliary body, also includes Iris diathermy or cyrotherapy;

(5) Non-Laser Surgery requiring incision of the Viteous;

(6) Non-Laser Surgery requiring incision of the Retina;

(7) Non-Laser Surgical Extraction of the Crystalline Lens;

(8) Non-Laser Surgery Intraocular Implants;

(9) Incisional or excisional Non-Laser Surgery of the Extraocular Muscles;

(10) Non-Laser Surgery of the eyelid for incisional Cosmetic or Mechanical repair of Blepharochalasis, ptosis, and tarsorrhaphy or eyelid malignancies;

(11) Non-Laser surgery of the boney Orbit, including Orbial Implants;

(12) Incisional or excisional Non-Laser surgery of the Lacrimal System other than Lacrimal probing or related procedures;

(13) Non-Laser Surgery requiring full thickness Conjuntivoplasty with graft or flap; and

(14) Any Non-Laser Surgical procedure that does not provide for the correction and relief of ocular abnormalities.

(c) the language of the Oklahoma Statutes shall be controlling if there is any conflict between this rule and the statutes.

Appendix 2: Safety and Efficacy of Allied Health Professional SLT [9]

Table 4. Pre- and post-selective laser trabeculoplasty (SLT) intraocular pressure (IOP, in mmHg). AHP: allied health professional.

	AHP delivered SLT		Ophthalmologist delivered SLT	
	Mean ± S.D. (range)	Median % IOP reduction (inter-quartile range)	Mean ± S.D. (range)	Median % IOP reduction (inter-quartile range)
Baseline IOP	20.9 ± 5.1 (12–45), *n* = 207		23.2 ± 5.3 (11–46), *n* = 88	
1 month post SLT	17.0 ± 4.4 (6–26), *n* = 49	16.0 (5.9–28.0)	18.8 ± 5.4 (12–40), *n* = 37	19.2 (13.6–30.5)
3 months	17.3 ± 4.5 (10–35), *n* = 119	16.7 (5.9–28.2)	18.1 ± 4.3 (11–29), *n* = 55	20.5 (1.8–27.8)
6 months	18.0 ± 4.9 (9–30), *n* = 59	16.7 (−5.2 to 29.2)	17.4 ± 4.4 (6–32), *n* = 55	18.7 (9.2–34.1)
9 months	16.7 ± 5.2 (9–34), *n* = 56	21.1 (9.8–31.4)	17.4 ± 5.1 (4–27), *n* = 34	20.0 (9.8–34.2)
12 months	17.6 ± 3.7 (12–28), *n* = 21	17.4 (5.6–25.0)	19.0 ± 5.5 (6–45), *n* = 73	20.5 (11.5–29.0)

Table 5. Comparison of 3-month follow up outcome with statistical analysis. See Table 4; IQR: inter-quartile range.

	AHP delivered SLT (*n* = 119)	Ophthalmologist delivered SLT (*n* = 55)	*p* values
Mean IOP ± S.D. (range)	16.9 ± 4.5 (10–35)	18.1 ± 4.3 (6–45)	t (78) = 0.50, *p* = 0.62 (unpaired t-test)
Median % IOP reduction (IQR)	16.7 (5.9–28.2)	20.5 (1.8–27.8)	*p* = 0.25 (Kruskal-Wallis test)

Table 6. Comparison of 12-month follow up outcome with statistical analysis. See Table 4; IQR: inter-quartile range.

	AHP delivered SLT (*n* = 21)	Ophthalmologist delivered SLT (*n* = 73)	
Mean IOP ± S.D. (range)	16.8 ± 4.3 (8–29)	19.0 ± 5.5 (6–45)	t (43) = −0.14, *p* = 0.89 (unpaired t-test)
Median % IOP reduction (IQR)	17.4 (5.6–25.0)	20.5 (11.5–29.0)	*p* = 0.98 (Kruskal-Wallis test)

AHP delivered SLT service

Table 7. Complications of selective laser trabeculoplasty (SLT) treatment. AHP: allied health professional; IOP: intra ocular pressure; AC: anterior chamber.

Complication	AHP delivered SLT (*n* = 333 procedures)	Ophthalmologist delivered SLT (*n* = 147 procedures)
IOP Spike	1 (0.3%)	2 (2.4%)
Dry eyes	6 (1.8%)	0
AC activity	4 (1.2%)	0
Subconjunctival haemorrhage	2 (0.6%)	0
Angle closure attack	0	1 (1.2%)
Mild hyphema	0	1 (1.2%)

Appendix 2 (Continued): Safety and Efficacy of Allied Health Professional SLT [9]

O Chadwick *et al.* AHP delivered SLT service

Appendix 1: Skills matrix for training of non-medical staff performing selective laser trabeculoplasty (SLT)

Activity	Achieved	Comments
Understands indications for SLT, demonstrating expertise in clinical assessment and rationale for treatment		
Understands how to assess patients for SLT including accurate gonioscopy		
Understands contraindications including inadequate visualisation of trabecular meshwork		
Demonstrates correct equipment set up and laser room care		
Understands pre and post-op care		
Understands how to perform SLT and has demonstrated correct technique		
Demonstrates knowledge of the complications of SLT and post-op management procedure		
Has completed supervised clinical practice at an appropriate standard		
Understands Trust policy on the use of lasers		
Understands Trust policy on consent		
Demonstrates effective communication skills with regard to the procedure and after care		
Understands safe discharge planning and follow-up care		
Has completed laser safety training - filed with laser protection officer		
Has achieved Independent Prescriber status as optometrist (or equivalent experience for orthoptists)		
Understands infection control policy and procedures		
Demonstrates good record keeping		
Demonstrates the ability to seek advice from ophthalmologists appropriately		

Appendix 3: Dr David Cockrell Senate Testimony (excerpt, with permission)[89]

DR. DAVID COCKRELL: Good afternoon Chairperson Parks. I am the guy from Oklahoma who can answer those questions…

I have served on the Oklahoma state board of examiners since 1996. I have served as a member. I have served as Vice President. I have served as the President of the Board. As a practicing optometrist I am also laser certified and I also performed every one of the procedures that they are talking about doing here in South Carolina and I am not alone.

The great majority of optometrists and certainly all the ones younger than me do perform the same procedures, and those include utilization laser procedures for treatment for after cataract procedures for glaucoma procedures, certainly injections for lid procedures that they do. The time line of laser utilization Oklahoma began in 1988, which is about the time it began in general ophthalmology. Lasers and eye care have only been around since the mid 70s experimental and early 80s in practice. Optometry can point to a 20-year unblemished track record in Oklahoma. We are the only medical group on Oklahoma that did outcome assessments. Someone referenced…there haven't been assessments or studies done. We did outcome assessments for the first 10 years to see whether or not we had a problem with optometrists doing those. We required that as the State Board. At the end of that first 10 years we had no, not one, single significant negative outcome. We went to court and had to produce those records, produce them in court and agreed with that. You know, we began utilization of laser surgical procedures by working in conjunction with ophthalmology practices and in co-management centers. Worked with many over that period of time.

In 1998, due to a lawsuit initiated by ophthalmology in 1997, where the court ruled they wanted the legislature to be specific as to whether or not we could do laser. In 1998 we specifically added the word "laser" and the other pharmacology that we do in 1998. It didn't change anything we had been doing for the previous 10 years when our bill was open-ended like medicine's is. The legislation did not specifically list the procedures we do, nor does it now. As you all know, improvements in medical technology frequently make current procedures obsolete and future methods or treatments are often more effective.

The statute in optometry in Oklahoma was written to intergrade those future technologies. I am the guy that wrote that statute, so if you have questions I can answer that.

Appendix 4: Letter to the Board of Examiners in Optometry in the State of Oklahoma: Laser Procedure Outcomes [87]

Board of Examiners in Optometry
State of Oklahoma
Office of the Executive Director

February 22, 2021

Ms. Shalini Puri, Senior Policy Analyst, Alberta Health,

In 1988 laser training was provided to optometrists at a joint meeting with ophthalmologists. Language in the Optometric Scope of Practice was interpreted to allow the Oklahoma Board of Examiners in Optometry to certify those who had received this laser training to perform laser surgery procedures. Between 1988 and 1998 the Board required the reporting of post-laser procedure outcomes and there were approximately 5,000 laser procedures performed with no negative outcomes.

Legislation, which took effect November 1, 1998, authorized the statutory definition of optometry to include laser surgery procedures. Since 1998 there have been an additional estimated 50,000 laser surgery procedures in which there were no complaints registered. The Board has been informed there were only two (2) insurance settlements made involving PRK. In those two cases a confidentiality agreement was in place. In total, Optometrists in Oklahoma have been providing laser surgery procedures for 32 years.

Optometrists in Oklahoma that perform laser procedures will use YAG, Argon and SLT lasers. The YAG laser is used to treat cloudy capsules, vitreous floaters and to perform iridotomy. Optometrists in Oklahoma use the Argon and SLT (Selective Laser Trabeculoplasty) lasers to treat glaucoma.

Additionally, laser eye care is provided by optometrists in a majority of the 77 counties in the State of Oklahoma. The accessibility of this care provides an economical benefit to the citizens of the state since travel expenses are greatly reduced. Oklahoma optometrists may also work together in the same offices as ophthalmologists. These optometrists provide care at the level of their laser certification. Insurance providers authorize payments for laser procedures for Oklahoma licensed optometrists which includes senior citizens covered by Medicare.

Today laser training is provided to students of optometry in all Colleges of Optometry, most of which are state supported. The Oklahoma Board of Optometry certifies all optometrists upon successful passing of Oklahoma State Board Exam with the laser exams being conducted at the time of the annual Board Exams. The National Board of Examiners (NBEO) provides laser testing on the laser education being taught in optometry schools for state Boards of Optometry.

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Tulsa, Oklahoma 74146

James Coburn, Board Member
PO Box 1665
Muskogee, Oklahoma 74402

Optometrists practicing in Veteran hospitals routinely provide laser procedures to our veterans if the optometrist's scope of practice by licensure will allow. Therefore, many optometrists practicing in VA hospitals will have an Oklahoma optometry license or license from another state that has an equivalent scope of practice.

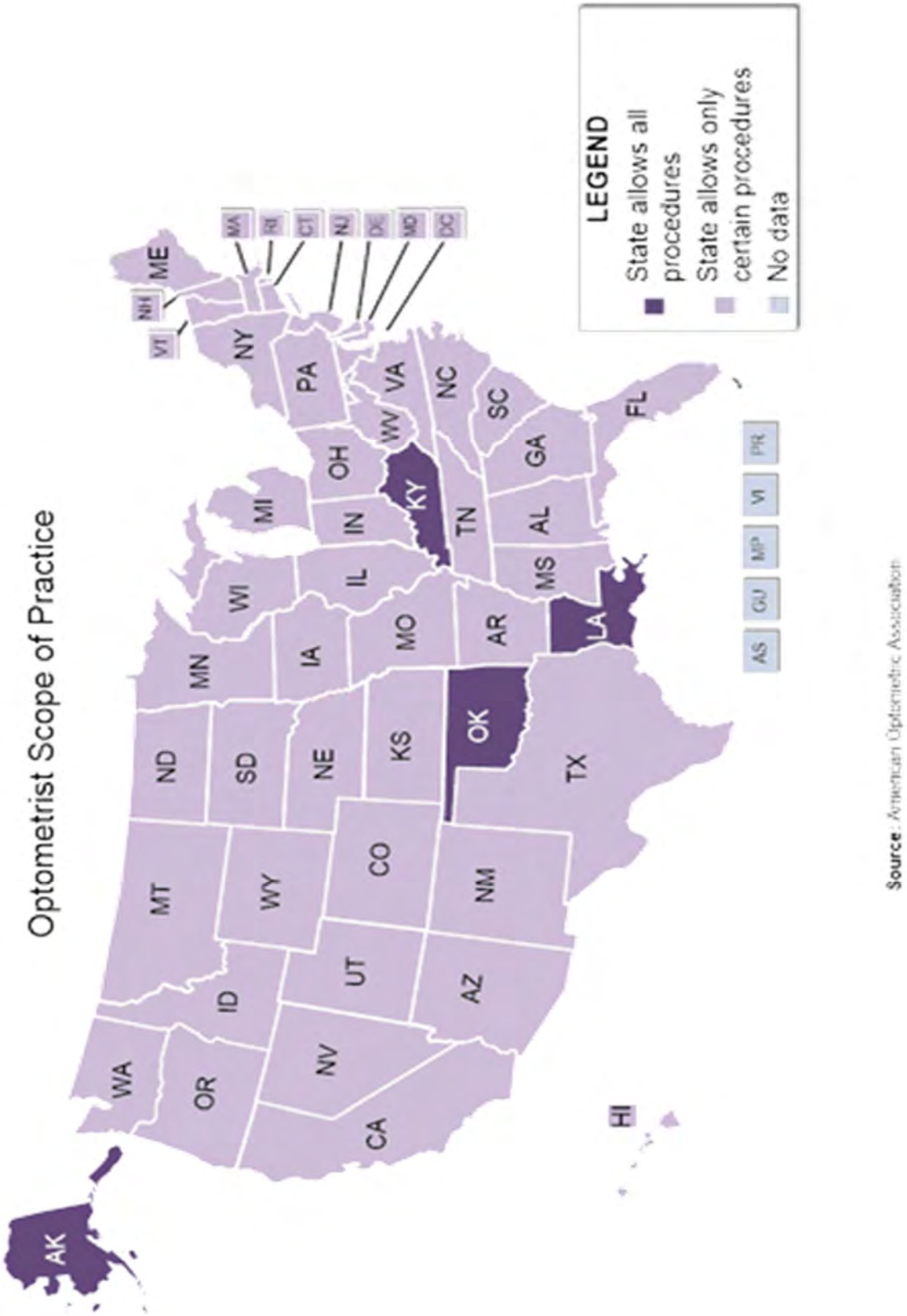
The Board of Examiners in Oklahoma does not require ophthalmic laser treatment reporting. The Board has not received one adverse event report from any of the lasers mentioned with YAG, SLT, Argon during the past thirty two years. It is estimated that over 50,000 procedures have been performed during this 32 year period.

Sincerely,

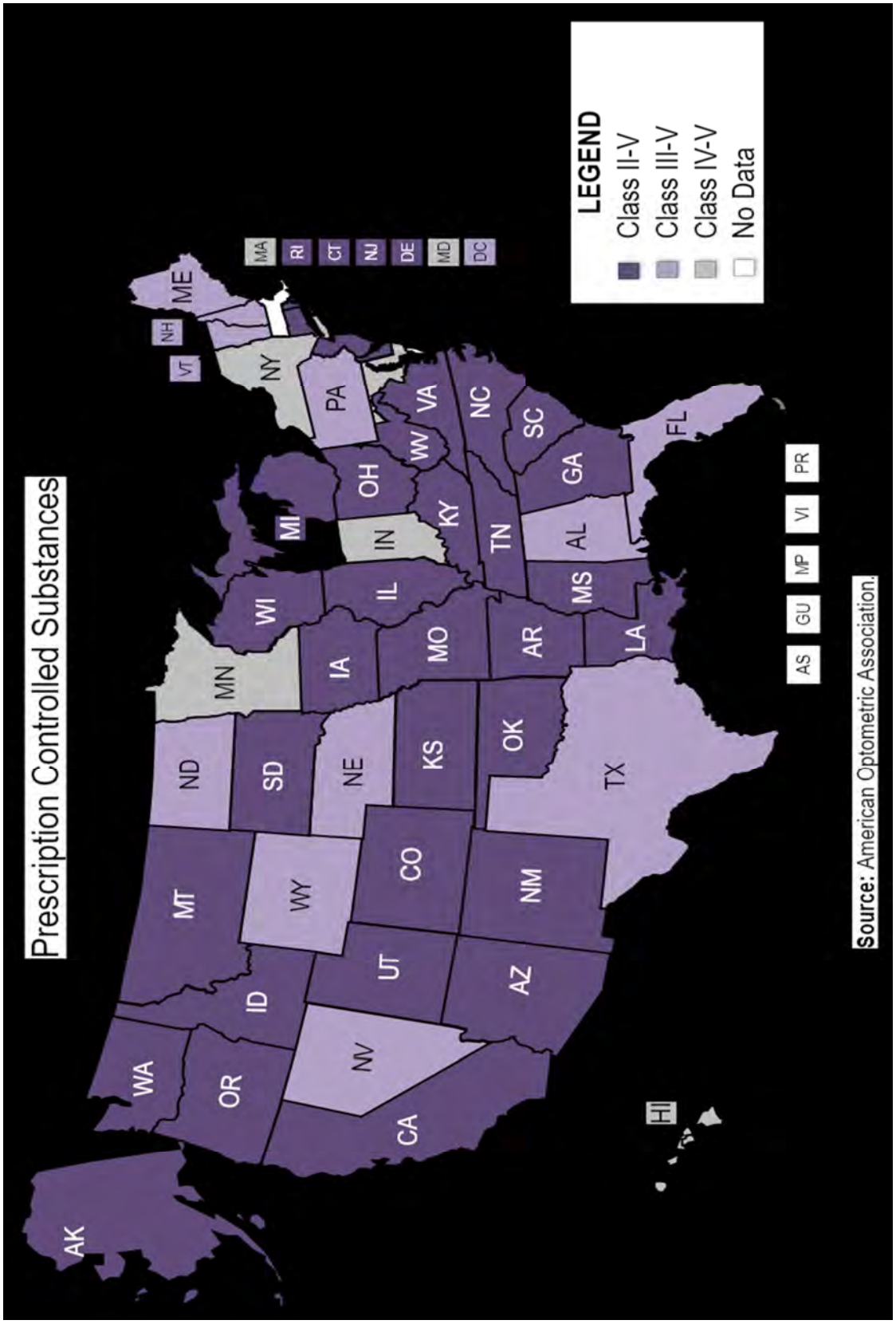
Russell Laverty, OD

Russell Laverty, OD, Executive Director
Oklahoma Board of Examiners in Optometry

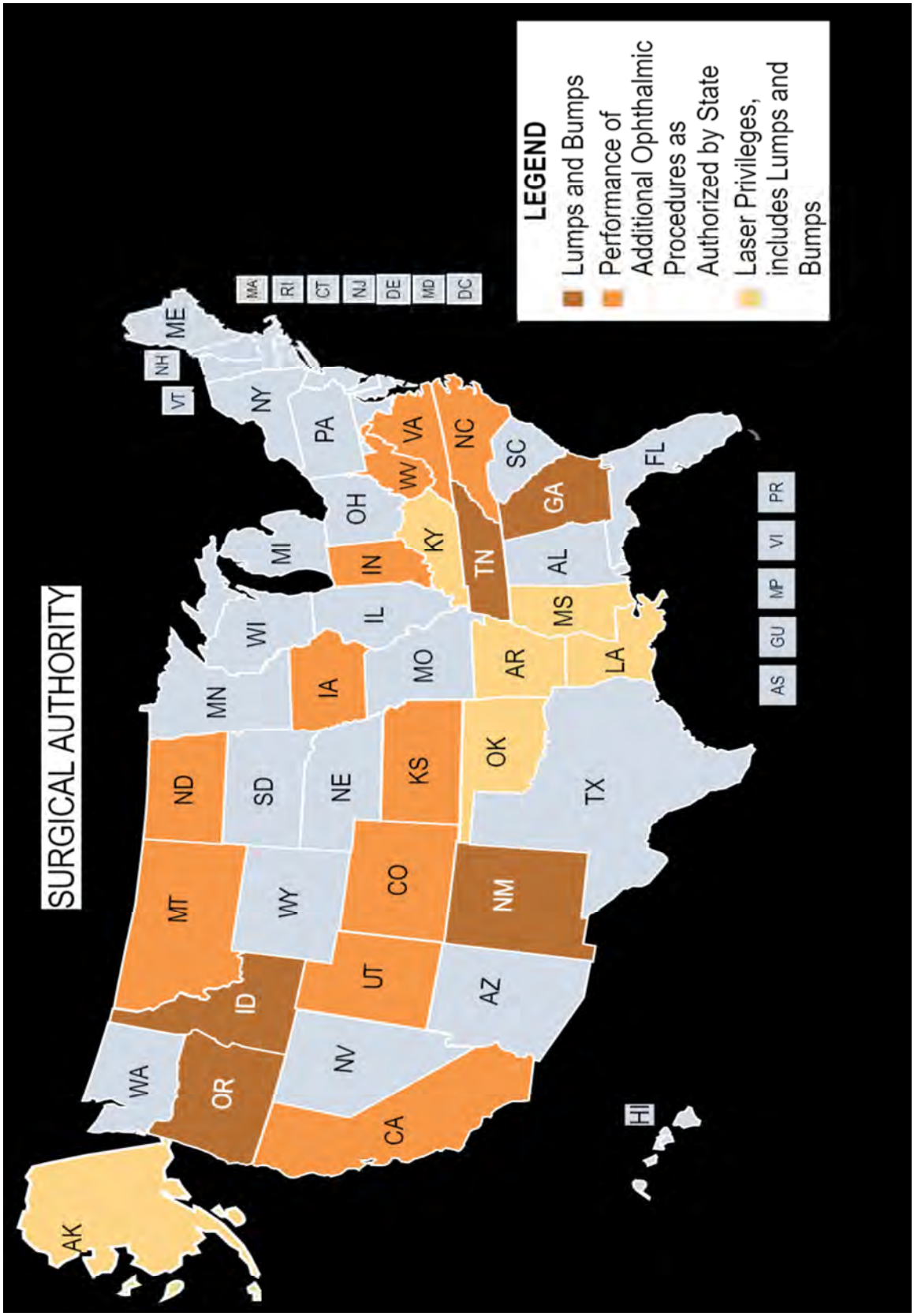
Appendix 5: Map of Overall Scope of Practice[102]



Appendix 6: Map of Controlled Substances Prescriptive Rights for Optometrists[102]



Appendix 7:Map of Surgical Authority for Optometrists[102]



NSUOCO Curriculum

Total Credit Hours - 172

First Professional Year

Fall (21 hours)

4101 Introduction to Optometry
4126 Geometric and Physical Optics
4133 Clinical Immunology and Microbiology
4167 Human Anatomy and Physiology
4184 Optometric Clinical Methods I

Spring (22 hours)

4203 General Pathology
4213 The Human Nervous System
4234 Vision Science I: Optics
4264 Ocular Anatomy and Physiology
4271 Interpersonal Communications
4283 Optometric Clinical Methods II
4291 Introduction to Clinic I
5103 General Pharmacology

Second Professional Year

Fall (21 hours)

5113 Binocular and Refractive Anomalies
5134 Vision Science II: Sensory Aspects
5153 Contact Lenses I
5164 Ophthalmic Optics I
5183 Optometric Clinical Methods III
5191 Introduction to Clinic II
5273 Ocular Disease I: Cataracts, Corneal, and External Ocular Disease

Spring (22 hours)

5203 Ocular Pharmacology
5215 Vision Science III - Motility/Binocular
5223 Ophthalmic Optics II
5233 Pediatrics
5253 Contact Lenses II
5291 Clinical Practice I
6023 Ocular Disease II: Glaucoma and Anterior Uveal Disease
6111 Research Methodology

Third Professional Year

Summer (10 hours)

6031 Physical Diagnosis
6051 Environmental Vision
6061 Functional Analysis
6081 Optometric Case Studies I
6093 Clinical Practice II
6122 Optometry Project I
6141 Gerontology

Fall (22 hours)

6153 Binocular and Perceptual Disorders
6163 Healthcare Systems and Epidemiology
6173 Ocular Disease III: Vitreal, Choroidal and Retinal Disease
6182 Systemic Disease
6195 Clinical Practice III
6251 Optometric Case Studies II
6262 Optometry Project II
6283 Vision Rehabilitation

Spring (17 hours)

6223 Strabismus and Amblyopia
6231 Optometric Clinical Methods IV
6243 Practice Development and Administration I
6272 Ocular Disease IV: Orbital and Neurological Disease
6295 Clinical Practice IV
7062 Optometry Project III
7081 Optometric Case Studies III

Fourth Professional Year

Summer (8 hours)

7031 Ophthalmic Applications of Lasers
7042 Office-Based Surgery
7095 Clinical Practice V

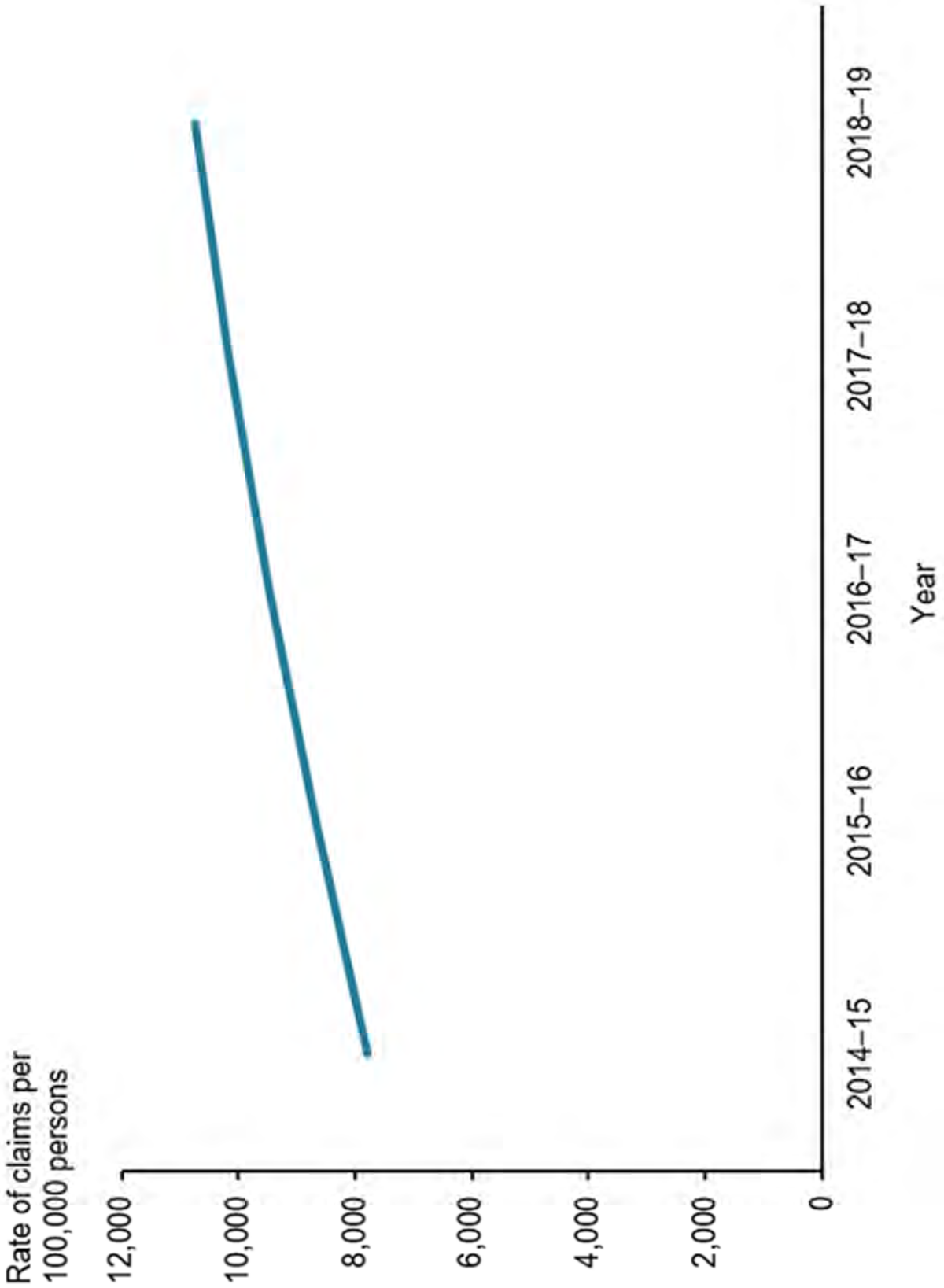
Fall (16 hours)

7101 Systemic Therapy in Ocular Disease and Trauma
7132 Differential Diagnosis of Ocular Disease and Trauma
7143 Practice Development and Administration II
7153 Contact Lenses III
7171 Optometric Case Studies IV
7196 Clinical Practice VI

Spring (13 hours)

7293 Clinical Practice VII

Appendix 9: Demand for Intravitreal Injections in Australia [151]



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