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Patterns and trends in optical and other health professional initial education, and its regulation

A rapid evidence review and expert interviews in selected jurisdictions

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1. Executive summary

1.1 Introduction

The purpose of this research is to provide the General Optical Council (GOC) with a clearer picture of the patterns and trends in initial or pre-registration health professional education to help inform its Education Strategic Review. The nine jurisdictions covered in this review were:

- Initial optical education in Australia, New Zealand, USA, Canada and South Africa.
- Initial non-optical health professional education within the UK covering medicine, nursing, dentistry and pharmacy.

The evidence in this research was collected via a Rapid Evidence Assessment (REA) of available academic and grey literature, supplemented by a series of in-depth interviews with selected experts across the different jurisdictions. More than 280 pieces of literature were reviewed and we engaged with 16 experts, mainly via telephone interview.

The review was conducted between September and November, 2017.

1.2 Contextual changes affecting initial education

Most jurisdictions included in this review share a number of **challenges** which influence what is required from initial education to prepare students for practice. These are inter-related and include:

- demographic change, including with an ageing population;
- more complex and long-term health needs;
- greater demand for health services; and
- increased pressure on healthcare systems.

These developments have led to more care being delivered in the community and to **changes in practice** such as both more multi-professional team and autonomous working, and an expansion of scopes of practice within a number of health professions including optics. In addition, major reviews in a number of jurisdictions have prompted a renewed focus on patient safety.

The mix of knowledge, skills and behaviour required of health professionals is evolving in line with the changing practice environment. Within optometry, **additional skill development** has been required in those jurisdictions where practitioners now diagnose and manage eye health conditions. Across all of the health professions, there is an increasing priority being placed the following:

- evidence-based practice:
- team working;
- a patient-centred approach to delivering care; and

- a commitment to career-long learning and development.

1.3 Cross-cutting patterns and trends identified in initial education

1.3.1 Regulatory patterns and trends

Regulators and accreditation bodies in all of the jurisdictions covered in this research have in common that they take a **largely outcomes-based approach** to their intervention in initial education. The standards set for education providers therefore relate to expected learning outcomes and development of competencies which are adapted to reflect changes in practice and associated professional skills required. Standards for initial education provision tend not to prescribe specific content or methods. The intention is to allow education providers the flexibility to design their own programmes drawing on their pedagogic expertise, and to innovate as appropriate, subject to a demonstration that the learning outcomes are being met.

There is considerable variation in how education standards have been drafted between jurisdictions. However, some **commonalities** across multiple jurisdictions include:

- an explicit articulation of the priority placed on ensuring patient and public safety;
- an emphasis also on the student experience and supporting learners;
- a close tie-in to learning outcomes; and
- a requirement that these outcomes are demonstrated across key aspects of education delivery (including the curriculum, assessment and governance).

Notwithstanding this outcomes focus, there are some instances where regulators have become, or are considering becoming, **involved in the input side** of initial education delivery. This intervention has tended to be in defined areas and for specific reasons. For example, in some jurisdictions standardised student assessments prior to qualification are in place or being considered as a way of ensuring that all graduates demonstrate the required competencies for safe independent practice.

Another key theme identified by this review is the **collaborative approach** taken to standard setting for initial education provision. In a number of the jurisdictions covered there are several different bodies with an interest in regulation or accreditation of initial education. It is typical for these organisations to work together to develop education standards. In some cases, this collaboration includes the relevant professional bodies and representatives of educational institutions, for example to help define the required professional competencies for qualification. This may also extend to regulators of other health professions, for example to achieve harmonisation on standards relating to transferable professional skills.

The involvement of a variety of stakeholders in the development of education standards can mean that the process of adapting and updating them can be lengthy. However, regulators recognise the need to ensure that **standards remain agile**, which may lead to those involved in standard setting to develop new methods for standard renewal in the future.

The approach taken to accreditation and quality assurance is broadly consistent across the various jurisdictions. Initial approval of a provider is based on a detailed assessment to ensure it is meeting the required standards. There is then regular monitoring, via feedback forms and other evidence collection, and periodic re-accreditation. Currently, most regulators apply a standardised approach to quality assurance across all education providers but another development we observed in a number of jurisdictions is a trend among accrediting bodies towards adopting a **risk-based approach** to quality assurance and re-accreditation of providers. In practice, it can be expected that this will lead to a differentiated approach to the oversight of individual providers based on a determination of risk.

1.3.2 Content and delivery patterns and trends

On one level, it was challenging to establish generalised patterns and trends in the content of education programmes or providers' approaches to delivery. This is in part due to the approach taken to standard setting which, as mentioned, is not prescriptive and encourages a **variety of methods** to be used by individual providers and programmes.

However, at a high level, a number of common pedagogic themes have been identified. These include:

- developing students' **critical appraisal skills** and their ability to undertake reflective learning and evidence based practice;
- providing students with sufficient and varied opportunities to gain **practical and clinical experience**;
- considering ways in which students can undertake **interprofessional learning**; and
- enabling students to learn and demonstrate the **general qualities required of health professionals**, including communication skills and an understanding of patient diversity.

These priorities have largely been driven by the outcomes-based standards that providers are required to demonstrate. Some also align with established learning theory, such as the benefits of an integrated curriculum and spiralled learning to embed practice alongside theory, or with acknowledged best practice, such as the World Health Organisation's recommendations related to interprofessional education.

There are **a number of different approaches** education providers are using, or considering, to respond to the required standards and learning outcomes. For example, there were reports of incorporating problem-based and team-based learning (PBL and TBL) methods to develop students' critical appraisal skills. In addition, a number of providers said that they are exploring ways of introducing practical experience into the curriculum at an earlier stage or extending the length of placements. There is also interest in different methods of building patient and public involvement (PPI) into education programmes. The adoption of new technology is another theme with one key application being in simulations to provide students with opportunities for more and earlier practical

experience. More generally, digital technology is being routinely incorporated into teaching and learning resources to provide 'blended learning' in an effort to increase student engagement and support their development.

However, as there are relatively few high quality evaluations of specific pedagogic approaches, their **impact and effectiveness is not clear**.

There is also evidence of **implementation challenges**, particularly with respect to introducing new content, increasing practical experience and providing interprofessional education opportunities. The difficulties faced are caused by a variety of factors, with the limitations of existing funding and course length reported as being particular constraints.

Looking to the future, providers (and regulators) expect that initial education programmes will need to keep adapting in response **to further changes in scopes of practice** and associated developments in required standards. They also envisage that there will be further focus on encouraging students to take **more responsibility over their own learning and development**. Finally, developing **leadership skills** has been identified as a common challenge for the health professions and it is anticipated that addressing this will be a priority for those involved in all stages of professional development including initial education.

1.4 Patterns and trends in the specific jurisdictions

The main thematic findings in each jurisdiction have been summarised below.

1.4.1 Non-UK Optometry[1]

Jurisdiction	Initial education requirements	Regulation	Content and delivery
Australia/New Zealand	• Optometry is a master's level qualification in Australia (MOptom), and a bachelor's (BOptom) qualification in New Zealand • The course length is mainly 5 years in both jurisdictions • Courses support the requirement for therapeutic endorsement of entry level professionals • There is no additional pre-registration stage	• A common initial education accreditation body (Optometry Council of Australia and New Zealand or OCANZ) and regulatory approach applies to both Australia and New Zealand • OCANZ's education standards are outcomes-focused • A collaborative approach with other health professional regulators has been taken in standard setting • There is a plan to move to risk-based quality assurance methods • Further harmonisation of regulation with other health professions is expected in future	• Providers also apply an outcomes-based approach to their curriculum design • Courses are intended equip graduates to diagnose and manage conditions • Effort is being made to increase students' clinical exposure including through a range of placements • Key pedagogic themes from the literature and interviews include: ○ Incorporating new technology into teaching ○ Developing evidence-based practice skills ○ Developing students' practical and clinical skills

[1] Dispensing optics/opticianry initial education is not included in this summary table due to the lack of evidence available on initial education, however what evidence we have identified is reported in the jurisdictional chapters related to optical education that follow.

Jurisdiction	Initial education requirements	Regulation	Content and delivery
			○ Providing interprofessional education opportunities ○ Developing 'cultural competency' • Further increases in scope of practice in the future are anticipated and these will need to be reflected in the content of initial education courses. This is expected to be challenging as the curriculum is reportedly already full
USA/Canada	• In the USA and Canada initial optometry education provided via a 4 or 5 year post-graduate Optometry Doctorate (OD) degree • At least 3 years of undergraduate study need to be completed before embarking on an OD degree • There is no additional pre-registration stage	• All optometry courses in the USA and Canada must be accredited by the Accreditation Council on Optometric Education (ACOE) in order to lead to professional registration • ACOE takes a broadly outcomes-based approach to regulation, however it specifies inputs where the board considers that these are essential to maintain a good outcome from education • Scrutiny of accreditation process in the USA is through the reauthorisation of the Higher Education Act and the US president's regulatory reform Taskforce	• Key educational themes identified in the review include: ○ Interprofessional education ○ Evidence-based practice ○ Life-long learning • In addition, new techniques and modes of learning are being used e.g. team-based learning, blended learning etc. • The existing scope of practice is broad, with recent further extensions taking place in certain US states and Canadian provinces, and there are expected to be further increases in the future • The curriculum is reportedly already full and it is becoming challenging to accommodate all areas of competency

Jurisdiction	Initial education requirements	Regulation	Content and delivery
South Africa	• Optometry courses are 4 year undergraduate (bachelor's) degrees • There is currently no additional pre-registration stage but this is being explored	• One overarching body, the Health Professionals Council for South Africa (HPCSA), is responsible for regulation of all registered health professions including optometry • The sub-board of the HPCSA with responsibility for regulation of dispensing optics and optometry is the Professional Board of Optometry and Dispensing Optics (PBODO) • The PBODO takes an outcomes based approach to regulation • The principles of the South African Constitution are enshrined in the composition of the PBODO: it includes members of the public and quotas for members from traditionally disadvantaged groups • PBODO is looking into a 4+1 course structure for optometry, with 4 years undergraduate education and 1 Foundation Year	• The scope of entry level optometry has recently increased to include therapeutics and pharmacology • Therapeutic training and practical experience is therefore now being incorporated into all bachelor's degrees in optometry and education institutions are undergoing a re-curriculation process • Other educational themes include: ○ Interprofessional education ○ Development of skills in identifying and implementing evidence-based practice ○ Development of communication skills to consult properly and effectively with patients ○ Developing the practice of lifelong continuing professional development ○ Introduction of blended learning (combination of classroom and other/online methods)

1.4.2 UK other health professions

Jurisdiction	Initial education requirements	Regulation	Content and delivery
Medicine	• Medical school is typically 5 years followed by 2 years of the Foundation Programme and at least 3 years of further specialty training under supervision • Graduates of medical school need to apply for provisional registration with the General Medical Council (GMC) to enter Foundation Year 1 and for full registration ahead of commencing Foundation Year 2	• The GMC has developed integrated undergraduate and postgraduate education standards • These standards are outcomes-focused and have a strong emphasis on patient safety as well as supporting learners and educators • The GMC applies a risk-based approach to quality assurance which draws on regular evidence collection • The experience of providing and receiving education is monitored by the GMC and it also shares good practice • The GMC is planning to update its outcomes for graduates • It is also considering the introduction of a standardised Medical Licensing Assessment	• The main pedagogic themes identified in the literature relate to: ○ Developing safe practice ○ Developing students' practical and clinical skills ○ Developing students' general professional skills ○ Incorporation of new technology and techniques into teaching
Nursing	• A 3 year undergraduate (bachelor's) degree • Pre-registration nursing education is divided into four fields of nursing	• The NMC sets standards of nursing education • The NMC is currently revising its educational standards and is moving from an input and compliance-based	• The primary themes in the academic literature align with those identified by the regulator and in the grey literature: ○ A strong focus on gaining clinical and practical skills, including through

Jurisdiction	Initial education requirements	Regulation	Content and delivery
	practice, one of which must be selected at the point of entry to the programme and is recorded as their field of nursing practice on admission to the register. • The Nursing and Midwifery Council (NMC) specifies that newly qualified nurses should undertake a year of preceptorship, however this is currently out of scope for the NMC's regulation of education	approach to an outcomes focused approach • The NMC is collaborating with other regulators where relevant in the development of these standards and the new standards utilise the GMC's educational regulation framework • Some other themes that have informed the NMC's approach to revising their educational standards include: ○ Service user and public involvement ○ Person-centred care ○ Interprofessional education ○ Increased scope of practice ○ Evidence based practice and critical appraisal skills	outreach and community settings, as well as simulated environments ○ Evidence-based practice and new ways of introducing this into the curriculum and clinical learning environments ○ Patient and public involvement ○ Interprofessional working ○ Developing professionalism
Dentistry	• Bachelor of Dental Surgery (BDS) is a 5 year registrable degree which is followed by up to 2 years of Foundation Training for those wishing to practise in the NHS	• The General Dental Council (GDC) has developed outcomes-focused education standards • However, it is considering becoming more input-focused in selected areas e.g. related to finance and funding issues	• The main pedagogic themes identified include the: ○ Development of evidence-based practice skills ○ Development of skills in effective practice and self-directed learning

Jurisdiction	Initial education requirements	Regulation	Content and delivery
		• It regularly monitors providers as part of its quality assurance procedures and reports on general performance including areas of deficiency • It is considering whether to take more of an active role also in the identification and sharing of good practice • The GDC is planning to update the learning outcomes which accompany its education standards • It also plans to more to a risk-based approach to quality assurance	○ Development of clinical and practical skills ○ Provision of patient feedback to students engaged in practical experience • There has also been academic interest in: ○ Methods of student selection and assessment ○ Incorporation of new technologies and techniques into teaching
Pharmacy	• Master of Pharmacy (MPharm) is a 4 year course which is followed by 1 year of pre-registration training	• The General Pharmaceutical Council (GPhC) has developed largely outcomes-based education standards • These standards include a requirement for education providers to integrate practical and theoretical/scientific aspects of their curricula • An outcomes-based approach is also taken by the GPhC to the application of its quality assurance processes	• The most prevalent themes in the literature concern: ○ Practical and clinical skill development ○ Interprofessional education opportunities • The GPhC has observed the following patterns and trends in education content and delivery: ○ Efforts to increase students' clinical exposure ○ An increased emphasis on the development of communication skills

Jurisdiction	Initial education requirements	Regulation	Content and delivery
		• There is a standardised registration assessment exam in place at the end of the pre-registration year • The GPhC is planning to update its education standards	• The GPhC expects that more 5 -year integrated (with Pre-Reg Scheme) MPharm courses may be provided in the future

2. Introduction

2.1 Context for this research

The General Optical Council (GOC) has four core functions as the regulator for the optical professions in the UK:

- Setting standards for optical education and training, performance and conduct.
- Approving qualifications leading to registration.
- Maintaining a register of individuals fit to practise, train or carry on business as optometrists and dispensing opticians.
- Investigating and acting where fitness to practise, train or carry on business may be impaired.

The GOC needs to be forward-looking in its approach to setting the standards for optical education, and accrediting and quality assuring education programmes and qualifications that lead to registration, in order to ensure that registrants are properly equipped to carry out the roles of the future. For this reason, in its Strategic Plan 2017-2020 the GOC has committed to delivering and implementing a strategic review of optical education and training to ensure that optical professionals (optometrists and dispensing opticians) are fit to practise in line with the GOC's standards throughout their career.

The first stage of this review was a formal call for evidence which the GOC made late last year. The GOC sought feedback on a range of questions about expected trends in eye care delivery and the implications for education programmes as well as the GOC's approach to education. Detailed responses to these questions were submitted by more than 50 stakeholders with an interest in UK-based optics education.

As a further stage of this strategic review, the GOC wishes to add to its understanding of initial or pre-registration education programmes, and their regulation, by considering how these are designed, delivered and regulated in other selected non-UK and non-optical jurisdictions.

2.2 Aims and scope of this research

The purpose of this research is to provide the General Optical Council (GOC) with a clearer picture of the patterns and trends in initial or pre-registration health professional education to help inform the Education Strategic Review. The nine jurisdictions covered in this review are:

- Initial optical education: Australia, New Zealand, USA, Canada and South Africa.
- Initial non-optical UK health professional education: Medicine, nursing, dentistry and pharmacy.

In addition to identifying general patterns and trends, this review highlights case studies of current approaches taken to define, deliver, accredit and quality assure initial optical and health professional education, including selection methods and admission requirements.

The following specific questions set out by the GOC were considered in conducting the review:

- What educational concepts, theories and methods currently inform the professional regulatory standards of health professional education? How are such approaches applied and justified? (e.g. learning outcomes, educational competencies)
- Are there any thematic domains that are common to the education standards in multiple jurisdictions? (e.g. environment, safety, quality, governance, assessment)
- Where, and to what extent, are national or regional qualifying/licensure examinations in evidence and, if at all, how are they integrated into professional regulatory requirements? Based on the evidence, what are the pros and cons of such examinations?
- How are health professional education programmes accredited and quality assured and how are these processes integrated, if at all, into professional regulation?
- What does the evidence indicate about the future direction of travel in professional regulation, standards and delivery of optical education and wider health professional education?

The review was conducted between September and November, 2017.

2.3 Methodology

The evidence in this research was collected via a Rapid Evidence Assessment (REA) of available academic and grey literature, supplemented by a series of in-depth interviews with selected experts across the different jurisdictions. The approach taken to both parts of the review is summarised below and further detail is included in Appendix 1.

2.3.1 Rapid Evidence Assessment

The scope of this review was broad, being concerned with identifying general patterns and trends across a number of health professions and geographies. Consequently, the body of academic literature identified was vast and also very diverse. In total, we identified 191 recent (from 2010 onwards) academic literature sources that warranted further review, having screened more than 500 academic sources for relevance. In addition, we reviewed approximately 90 grey literature sources.

Most of the academic literature focused on one specific pedagogic approach, often in only one setting, and there were very few sources identified that reported on patterns and trends. We managed this diversity by thematically analysing and categorising each of the sources identified and,

in so doing, we were able to determine some patterns and trends across the whole body of academic literature. The full thematic analysis of the academic sources is contained in Appendix 2.

Almost all of the academic literature we found in relation to initial education in the jurisdictions of interest as low or very low in terms of research quality[2]. Only high or moderate quality studies have been highlighted as specific case examples in this review. This filtering approach ensures that the examples that have been highlighted have had their impact validated.

There were also some gaps in the literature:

- There is generally little academic or grey literature focused on South Africa, and very few sources have been published since 2010, so we also included some pre-2010 sources.
- There was a general paucity of research related to initial education in dispensing optics. This may be because the function is not regulated in all the countries examined and also due to delivery of dispensing optics education being largely vocationally based.

2.3.2 Expert interviews

We engaged with a total of 16 experts, 15 of whom we interviewed in detail[3], across the nine jurisdictions of interest. The interviews were with representatives from regulators and accreditation bodies, as well as education providers. A full list of the participants is contained in Appendix 3.

The interviews lasted an average of 45 minutes and took place by telephone or Skype between 16 October and 2 November, 2017.

We have triangulated the evidence collected in the interviews with the literature in order to fact-check and ensure the validity of the findings reported. In addition, all interviewees had the opportunity to review the relevant chapters of the report and correct any factual inaccuracies or misrepresentations.

In some cases interviewees were reluctant to comment on areas they felt were outside the scope of their organisations. For example, a number of regulators were not able to identify patterns and trends in education content and delivery, or examples of good practice.

Due to the limited interview programme it was not possible for us to represent the perspective of all organisations involved in standard setting in those jurisdictions where multiple bodies had a role in this.

2.4 Report structure

The detail report to follow has been structured as follows:

[2] See Appendix 1 for more detail on how the quality of the academic literature was assessed
[3] We engaged in ongoing email correspondence with the 16th expert due to limitations in their availability for a telephone interview

- **A contextual overview** which provides some high level contextual points that are relevant to the interpretation of the educational review findings that follow.
- **A chapter relating to optical education and its regulation in the selected international jurisdictions**. Within this chapter the USA and Canada are considered together, because of their shared regulation of optometric education and Australia and New Zealand are also considered together for the same reason. South Africa is reported separately. Where two jurisdictions are considered together both commonalities and differences are described.
- **A chapter relating to initial education and its regulation of the other selected health professions in the UK**, which is subdivided by the specific professions.

Each of the jurisdiction-related sections is structured in the same way for ease of navigation and comparability between the jurisdictions:

- Mechanics of initial education and its regulation (which outlines the bodies involved in regulation and/or accreditation of initial education and the structure of initial education programmes).
- Approach to regulation and requirements of initial education (which covers the standards required of providers, competencies expected of new registrants and drivers of the approach taken to regulation and/or accreditation).
- Content and delivery of initial education (which covers the main patterns and trends identified in terms of content and delivery of education programmes).
- Quality assurance of initial education (which covers the accreditation and quality assurance process applied to providers as well as methods of student selection and assessment prior to qualification).
- Looking to the future (which provides information on both planned developments and expected trends).

2.5 Guide to interpretation

As the purpose of this report is to provide an overview of patterns and trends, it has been necessary to summarise the findings. In some cases, suggestions for further reading to provide greater detail on specific themes have been made in the footnotes. It may be that the research highlights specific themes that the GOC identifies as warranting further research.

Whilst this research considers planned and potential future developments, due to the rapidly changing landscape it can only provide a picture of the patterns and trends in health professional education at this time and may need to be updated in the future.

3. Contextual overview

To contextualise the findings from this education review, we have summarised some key developments in the broader practice environment which have a bearing on what is required from initial education to prepare students for practice. The themes below were widely present across the literature reviewed for this research, and were also commented on by many of the experts we interviewed.

3.1 Common challenges

Most of the jurisdictions covered in this review share a number of challenges which have a bearing on what is required from initial education to prepare students for practice. Demographic change and, in particular, an ageing population, is leading to greater demand for health services, and more complex and long-term health needs. This is placing increased pressure on healthcare systems which are already subject to funding constraints. Hospital services are particularly affected, which is providing a strong policy impetus for more care to be delivered in the community. Another contributing factor to this development is an increased policy focus on 'person-centred care'.

3.2 Changes in practice

These developments have led to changes in practice such as both more multi-professional team and autonomous working, and an expansion of scopes of practice within a number of health professions including optics. In addition, major reviews in a number of jurisdictions have prompted a renewed focus on patient safety.

3.3 New priorities

Literature and expert opinion suggests that health professionals have always required a mix of knowledge, skills and behaviour, including both scientific knowledge and clinical skills, and both practice-specific skills and transferable professional qualities. However, what is needed is evolving in line with the changing practice environment. Within optometry, additional skill development has been required in those jurisdictions where practitioners now diagnose and manage eye health conditions. Across all of the health professions, there is an increasing priority being placed on evidence-based practice, team working, applying a patient-centred approach to delivering care, and also to being committed as a professional to career-long learning and development.

4. Initial optical education in non-UK jurisdictions

4.1 Australia and New Zealand

4.1.1 Mechanics of initial education and its regulation

Common standards and a common process of regulating optometry education apply to Australia and New Zealand. The Optometry Council of Australia and New Zealand (OCANZ) is an independent agency that assesses optometry education programmes in both Australia and New Zealand. Accreditation functions to assure the regulators of the provision of high quality education and training and that applicants for registration are suitably qualified to practise in a competent and ethical manner[4]. Once accreditation is granted by OCANZ, the regulators in Australia (Optometry Board of Australia or OBA) and New Zealand (the Optometrists and Dispensing Opticians Board New Zealand or ODOB) must approve the decision before the programme becomes an approved programme of study for the purpose of registration[5].

Optometry requires a master's level qualification in Australia. This means students first need to complete a bachelor's degree (e.g. Bachelor of Vision Science) before qualifying to commence studying for a Master or Doctor of Optometry. Total course lengths vary from three and a half (for an accelerated course) to five years in Australia. In New Zealand, students gain optometry qualifications through a Bachelor of Optometry, which is a five-year course[6]. There are currently five approved entry-level optometry education providers in Australia and one in New Zealand.[7]

All Australian and New Zealand optometry schools must teach therapeutics reflecting changes in the scope of practice for optometrists in both countries requiring therapeutic endorsement for all entry-level practitioners.

In both Australia and New Zealand, successful completion of an approved optometry degree will enable the graduate to apply to enter the optometry register, with no additional pre-registration training required. Optometry graduates from Australia and New Zealand are entitled to work in either country provided they register with their respective registration boards.

The approach to overseeing dispensing optics training is different as this is only a regulated title in New Zealand and not in Australia. However, even in New Zealand the tasks performed by a dispensing optician are not regulated or restricted, so unregistered people can undertake the same

[4] http://www.optometryboard.gov.au/Accreditation.aspx
[5] http://www.ocanz.org
[6] The only optometry course in New Zealand is provided by University of Auckland. This includes a first overlapping year with medicine and pharmacy and then 4 subsequent years of optometry study
[7] http://www.ahpra.gov.au/Education/Approved-Programs-of-Study.aspx. OCANZ provides accreditation reports to the boards of OBA and ODOB on the programmes of study it has assessed and accredited. The regulators' boards then may approve, or refuse to approve, the accredited programme of study as providing a qualification for the purposes of registration. The Board's approval may also be subject to conditions.

tasks as a registered dispensing optician, they just cannot use the same title[8]. In New Zealand, registering as a dispensing optician requires the applicant to provide evidence of attainment of one of the prescribed and accredited qualifications accepted for registration as well as completion of a minimum number of hours of dispensing in an optical dispensing practice over a specified period[9].

There are no New Zealand-based qualifications prescribed for registration as a dispensing optician as there are no New Zealand-based education providers that offer a course. However, a couple of the Australian providers currently offer, or have provided in the past, practical testing facilities in New Zealand so that New Zealand-based students can learn remotely for the most part and use the practical facilities when required.

Lindsey Pine, Registrar of ODOB, reports that the board accredits these dispensing optics courses via formal application and assessment and then regularly re-accredits these courses to ensure they maintain the required standards for competent practise in New Zealand[10]. This reaccreditation process typically happens every five years unless the education provider signals that there has been a major change to the course.

Because dispensing optics is not a regulated function in Australia, and we were unable to find any further information in Australasia on patterns and trends in dispensing optics training, the remainder of this chapter focuses on optometric education and training.

4.1.2 Approach to regulation and requirements of initial education

OCANZ states on its website[11] that:

"Accreditation of optometry education providers performs a number of important functions, including:

- *Assuring the Registration Boards that graduates are effectively prepared for entry to the profession (including therapeutic practice).*
- *Providing schools with regular feedback on the contemporary needs of the profession."*

The aim of the accreditation process is to assess an optometry programme against OCANZ's standards. OCANZ does not prescribe the curriculum for optometry programmes. Instead, its standards for the development of optometry programmes are intended to allow each optometry school the flexibility to develop its own curriculum it order to deliver outcomes that demonstrate the standards have been met.

[8] As reported by Lindsey Pine, Registrar of ODOB
[9] https://www.odob.health.nz/DO_registration
[10] https://www.odob.health.nz/clinical_competence
[11] http://www.ocanz.org/accreditation

OCANZ finalised its new *Accreditation Standards for Entry-Level Optometry Programmes*[12] in 2016 and these came into effect in January 2017. One key feature of the new standards is that they take a common approach with accreditation councils representing a number of other health professions in areas such as prescribing, interprofessional teaching and learning, and cultural competence[13]. This means that 5 accreditation councils including OCANZ have adopted a number of common high-level standards, each with adaptations to include profession-specific evidence requirements.

Sian Lewis, Executive Officer, and Susan Kelly, Accreditation Manager, at OCANZ report that there is a history of strong collaboration between regulators in Australia, including with respect to education standards, to ensure that common issues are addressed in the same way. This is partly driven by the structure of the regulatory landscape, which includes a number of bodies with a crosscutting focus across the health professions, including:

- The National Accreditation and Regulation Scheme[14], which covers 14 health professions, with one of its key aims being to protect the public by ensuring that only suitably trained and qualified practitioners are registered.
- Australian Health Practitioner Regulation Agency (AHPRA)[15], which is the organisation responsible for the implementation of the National Accreditation and Regulation Scheme across Australia.
- The COAG Health Council[16], which provides a mechanism for the Australian Government, the New Zealand Government and state and territory governments to discuss matters of mutual interest concerning health policy, services and programmes.
- The Tertiary Education Quality and Standards Agency (TEQSA)[17], which is Australia's independent national regulator of the higher education sector.

Collaboration between regulators and accreditation councils representing different health professions has also been influenced by a desire to maximise efficiency, including by resource sharing. For example, the Australian Dental Council had previously reviewed their accreditation standards and OCANZ was given access to this work to inform their own review.

The new OCANZ accreditation standards comprise five domains[18]:

1. Public safety (which is now more explicitly highlighted compared to the previous version).
2. Academic governance and quality.

[12] OCANZ, *Accreditation Standards and Evidence Guide for Entry-Level Optometry Programmes*, Part 2 – Standards (January 2017)
[13] OCANZ – Annual Report (July 2015- June 2016)
[14] http://www.health.gov.au/internet/main/publishing.nsf/content/work-nras
[15] http://www.ahpra.gov.au/About-AHPRA/Who-We-Are.aspx
[16] https://www.coaghealthcouncil.gov.au
[17] http://www.teqsa.gov.au
[18] OCANZ, *Accreditation Standards and Evidence Guide for Entry-Level Optometry Programmes*, Part 2 – Standards (January 2017)

3. Programme of study.
4. The student experience.
5. Assessment.

A standard statement articulates the key purpose of each domain and this is supported by multiple criteria to demonstrate what is expected of an OCANZ accredited programme in order to meet each standard statement.

The accreditation standards also closely align with entry-level competency standards for optometrists which have been developed by the optometrists' professional association in Australia[19] and the regulator in New Zealand[20]. The Australian competency standards were last updated in 2014 based on advice of a broad-based steering group representing the profession, in order to reflect best practice. The New Zealand competence standards were developed in 2010 and are due for review in November 2017.

4.1.3 Content and delivery of initial education

The regulator's perspective

OCANZ characterises the Australasian approach to optometry education as being designed to equip graduates not just to treat and refer, but also to diagnose and manage, following the model of US optometry education. New Zealand is further along this journey than Australia reflecting differences in the scope of practice between the two countries. For example, in Australia optometrists are permitted only to prescribe topical therapeutics and they are restricted to prescribing from a specific list. In New Zealand optometrists are authorised to prescribe any medication required by the optometry practice and this includes oral medicines.

A number of the changes to course design have been driven by the need to incorporate therapeutics. This requirement has led to longer courses, a greater number and diversity of clinical placements and more exposure to ophthalmology.

Case examples from the academic interviews

Aligning with OCANZ'S approach to accreditation, a key feature of Australasian optometry schools reported by the academics we interviewed is their application of an outcomes-based approach to the design of their courses:

Examples of how outcomes-based education is applied

Professor Harrison Weisinger, formerly Foundation Director of Optometry at Deakin University[21] in Australia, says that the principle of outcome-based education, drawn from medical education,

[19] Optometry Australia, *Entry Level Competency Standards for Optometrists* (2014)
[20] ODOB, *Standards of clinical competence for optometrists* (November 2010)
[21] Professor Weisinger is now Global Professional Services Director at Specsavers Optical Group

was central to the school's approach when it was set up in 2012. Competencies were treated as intended learning outcomes and formed the basis of each pedagogic unit by articulating the goals that must be achieved, determining the acceptable evidence of having achieved the goals and planning a suitable curriculum and teaching materials that will deliver the goals and standards[22].

Craig Woods, current Professor of Optometry at the Deakin University School of Medicine, says: "*we reverse engineered the programme. The end point was the competency standards and from there we decide the education steps needed to get there."* Their approach also incorporated case-based and problem-based learning paradigms to allow students to contextualise what they are learning. In addition, the programme is team-based, requiring students to work in different teams throughout the duration of the course, and problem-based. Assessment is regular, on conclusion of each weekly case.

Other Australian optometry schools have also adopted a competency-based approach. For example, Professor Fiona Stapleton, Head of the School of Optometry and Vision Sciences at the University of New South Wales, says: "we *don't list subjects, we just show how our teaching addresses competence."*

A number of associated trends have also been identified by the academics we interviewed, including:

- A greater emphasis on evidence-based practice, including through problem-based learning and reflective learning, with the University of New South Wales taking a lead in a project to develop resources for educators on this theme[23].
- A very clear articulation of schools' expectations around students' practical skills across a range of ocular diseases.
- An emphasis on cultural competency, to prepare students to work with culturally diverse patients, reflecting the emphasis on this in the OCANZ standards.

Another general development is an effort to increase the clinical exposure provided to students, by providing more and longer placements, and in a greater variety of settings. There are a number of ways different optometry schools currently provide clinical experience:

Approaches to providing practical and clinical experience

The optometry school at University of New South Wales In Australia offers a mixed model consisting of internal, highly supervised staff-student clinics progressing to external placements. It offers placements in primary and emergency care, ophthalmology, as well as rural and international settings.

[22] See also Weisinger H and Prideaux S, 'Modernising Optometric Education in Australia: Ideas from Medical Education in *Optometric Education*, (Volume 31 all 2011)
[23] https://www.eboptometry.com

At The University of Auckland, students receive two-thirds of their patient exposure through in-house clinics but there are also a number of external opportunities provided such as a large-scale school vision screening programme, as well as placements at a prison, hospital eye departments and via the Blind Foundation.

The optometry programme at Deakin University is the only one in Australia to provide their clinical exposure fro their students at external placements. Its placement programme culminates in a supervised extended clinical residential placement programme occupying the final 6 months of the programme.

There is a view among Australasian academics that more still needs to be done within education programmes to prepare optometry professionals to adapt and become more integrated as part of the wider healthcare system, working alongside other healthcare professionals. However, some challenges for the delivery of interprofessional education have been identified, particularly for optometry schools situated in universities not teaching other healthcare professionals. On the other hand, some optometry schools have found that being part of a wider medical faculty can be helpful in enabling them to provide a range of interprofessional education opportunities:

Approaches providing interprofessional education

At The University of Auckland, first year optometry students are now taught a common overlapping curriculum with pharmacy and medical students. In addition, there are two faculty-wide interprofessional education events, one being a four-day training programme on cultural competency and the other a 2-day workshop on quality and safety in healthcare. In both events students work in an interdisciplinary team to consider real healthcare cases and determine appropriate interventions.

Deakin University offers a 12-hour interprofessional care plan module as part of its programme (Interprofessional Collaboration in Health Care). This teaching unit has the optometry students' education integrated with medical, nursing, occupational health and medical imaging students.

A further general trend identified is towards incorporating more digital techniques into teaching:

Examples of incorporating digital technology into teaching

All of the courses offered at University of New South Wales are blended to some degree. For example, optical students at the University of New South Wales are now required to access online content and videos, as well as to complete multiple-choice online surveys, before attending labs for practical work. All lectures are available online and there are a variety of additional digital teaching and learning resources available. These digital resources increase each year as the technology improves and teaching staff become more comfortable using them.

During the Clinical Residential Programme offered at Deakin University (the final two semesters), the students are placed in optometry practices all around the country and are remote from the university. They, however, continue to access course curriculum, teaching webinars and assessments via the online system offered by the University, 'Cloud Deakin'.

What the academic literature shows

The academic literature on approaches to initial education and training in Australasian optometry covers a range of high-level themes, with the most prevalent of these being:

- Incorporation of new technology and techniques in teaching;
- Developing critical appraisal skills and the ability to undertake evidence-based practice; and
- Practical and clinical skills development.

The overarching themes align with and support what the academics we spoke to identified as patterns and trends in the content and delivery of optometric education.

While no high quality studies have been identified, two reviews warrant highlighting as these provide further information relevant to culturally competent practice and interprofessional health education, each of which have been highlighted as priorities in the Australasian context:

How Australian and New Zealand schools of optometry prepare students for culturally competent practice[24]

This study investigated how Australian and New Zealand schools of optometry prepare students for culturally competent practice. The aims were to review how optometric courses and educators teach and prepare their students to work with culturally diverse patients, and to determine the demographic characteristics of current optometric students and obtain their views on cultural diversity. All Australian and New Zealand schools of optometry were invited to participate in the study. Data were collected with two surveys.

Four schools of optometry and 63 students participated in the surveys. Cultural competency training was reported to be included in the curriculum of some schools, to varying degrees in terms of structure, content, teaching method and hours of teaching. Among second year optometry students across Australia and New Zealand, training in cultural diversity issues was the strongest predictor of cultural awareness and sensitivity after adjusting for school, age, gender, country of birth and language other than English. This study provides some evidence that previous cultural competency-related training is associated with better cultural awareness and sensitivity among optometric students. The variable approaches to cultural competency training reported by

[24] Truong et al., 'How Australian and New Zealand schools of optometry prepare students for culturally competent practice' in *Clinical and Experimental Optometry*, Volume 97, Issue 6 (November 2014)

the schools of optometry participating in the study suggest that there may be opportunity for further development in all schools to consider best practice training in cultural competency.

International and Australian developments in interprofessional education relevant to health professionals[25]

This literature review, which covered Australia as well as international jurisdictions including the US, Canada, UK, Scandinavia, the Asia Pacific Region and developing countries, found that while there is an extensive body of descriptive literature on interprofessional health education (IPE), the evaluations of outcomes are mostly limited to the level of participant satisfaction or reaction, and are inconsistently measured using a range of approaches and tools.

A number of barriers to successful implementation of IPE were also identified, including:

- Differing expectations of each profession which may be as a result of differences in requirements and regulations between the professions.
- The fear that interprofessional practice will lead to a loss of status, a loss of professional identity, and a dilution of the role of individual professions in patient care.
- Historical interprofessional and intraprofessional rivalries.
- An already full course curriculum and clinical placement schedule for each profession.
- Conflicting academic calendars and timetables offering very few opportunities for interprofessional activities (e.g. clinical placements).
- Differing ability and interests across students.
- Lack of availability of suitably trained academic staff and clinical placement supervisors to facilitate interprofessional programmes.
- Time and resource commitments involved in establishing interprofessional programmes.
- Lack of facilities and resources to deliver campus based interprofessional programs e.g. tutorial rooms.
- Lack of geographical co-location of individual schools/ faculties.

4.1.4 Quality assurance of initial education

Accreditation and quality assurance of providers

[25] G Nisbet et al., Interprofessional Health Education, A Literature Review; Overview of international and Australian developments in *interprofessional Health Education* (May 2011)

OCANZ is responsible for accrediting education providers and it does this based on its assessment of educational programmes against its accreditation standards. Consistent with the national requirements for all education providers specified by the Australian national regulator TEQSA, OCANZ requires schools to have processes and procedures in place to monitor the effectiveness of the optometry curriculum in achieving outcomes that are consistent with the OCANZ entry-level optometry standards. Schools also need to have formal mechanisms for programme review and for implementing changes to the curriculum and methods of teaching where required. Ultimately, OCANZ needs to be satisfied that students will be fully trained in all of the required competencies.

OCANZ re-accredits providers on an eight-year cycle. TESQA has provided OCANZ and other Australian health profession accreditation councils extensive advice on what needs to happen during the quality assurance process, including a requirement to ask for evidence of how the school is consulting with students, employers and the community, and how responsive it is to feedback from these audiences.

During its re-accreditation visits OCANZ undertakes interviews with students and staff, recent graduates and employers, and external clinical placement coordinators. OCANZ also reviews minutes of the school's stakeholder committee to ensure that their recommendations have been implemented. In the intervening period OCANZ monitors all schools through its annual reporting requirements[26]. OCANZ may also impose conditions on the accreditation of individual education providers requiring additional periodic reporting by that provider.

Selection of students

OCANZ does not impose any specific requirements on optometry schools regarding the selection of students. Currently, optometry students are selected solely based on their academic attainment. This differs from the approach taken by Australian medical schools which apply a mixed approach, which also includes interviews as well as tests of communication, problem solving and reasoning skills. The University of New South Wales optometry school previously trialed the selection approach used by its medical faculty but found that it was no more effective at predicting performance than ATAR so it reverted to back to their former approach.

The approach is different at the only New Zealand optometry school, in Auckland. There, a common approach drawing on both the student's Grade Point Average (GPA) plus multi-mini interviews (MMI) is applied to selection of all students within the Faculty of Medical and Health Sciences. The MMI tests students on a range of skills including their communication skills, ability to analyse information and cultural sensitivity. This approach was introduced for consistency across the faculty and is believed to be particularly helpful in making decisions about students who are on the border of the academic thresholds for entry into the course.

Assessment of students prior to qualification

[26] For more information refer to OCANZ, *Accreditation Manual for Optometry Programs in Australia and New Zealand, Part 1 – Processes and Procedures* (August 2012)

Currently, each optometry school is responsible for developing its own methods of student assessment. However, OCANZ sets out the outcomes it requires for assessment in a dedicated section within its accreditation standards (Standard 5)[27]. The overarching requirement is that assessment is 'fair, transparent and reliable'. This in turn requires there to be a clear relationship between learning outcomes, competencies and assessment.

These requirements align with the expectations of TESQA that 'the methods of assessment are consistent with the learning outcomes being assessed, are capable of confirming that all specified learning outcomes are achieved and that grades awarded reflect the level of student attainment'[28].

4.1.5 Looking to the future

OCANZ anticipates moving more towards risk-based accreditation processes in the future. It is currently engaged in collaborative work with other Australian Accreditation Councils to determine if different rules should apply to higher versus lower risk providers. This work will require OCANZ to agree on a method it can use to measure risk objectively in order to classify providers appropriately.

In addition, OCANZ expects that accreditation standards and approaches to approving education programmes will become even more harmonised between the different health professions moving forward as the government has recently commissioned a review that has articulated this as the future direction[29].

The academics we interviewed foresee further changes to the practice of optometry, particularly in response to a growth of age-related eye health issues such as glaucoma, cataracts and age-related macular degeneration (AMD), including:

- More involvement of optometrists in healthcare pathways, requiring them to work in in multiprofessional teams.
- More comprehensive access to drugs by Australian optometrists, comparable to their New Zealand counterparts.

It is believed that these changes will in turn affect what is required from initial education. For example, interprofessional education is expected to become even more important to prepare students and teach them the appropriate skills to work in mixed teams. Further changes in scope with respect to therapeutic agents will also require appropriate curriculum modifications.

One challenge by the academics we spoke to is how to make room for new content in an already "*overstuffed curriculum".* It is felt that there will need to be rationalisation and decisions about removing some legacy content in order to accommodate new material.

In addition, a number of other trends in optometric education are expected, including:

[27] OCANZ, *Accreditation Standards and Evidence Guide for Entry-Level Optometry Programmes*, Part 2 – Standards (January 2017)
[28] https://www.legislation.gov.au/Details/F2015L01639/Html/Text#_Toc428368851
[29] https://chf.org.au/sites/default/files/final_asreview_draft_report_chf_prestn_14-09-17.pdf

- Encouragement of students to take more responsibility for their own learning (including via tools such as e-portfolios and problem-based learning, tools currently used in Australasian medical schools and increasingly evident in optometry programmes) and ultimately help them develop the practice of lifelong learning and skills development.
- Introduction of specific methods within education and training to help develop students' leadership skills (this is seen as a current gap).
- Exploration of new ways to introduce more intensive clinical experience into courses, as well as to expose students to practical experience from an earlier stage.

4.2 USA and Canada

In this chapter, there is separate reporting of initial education for optometry and dispensing optics (known as opticianry in the USA and Canada) as the two are regarded as entirely separate disciplines and they have different regulation. Sections 4.2.1-4.2.4 describe optometry initial education and its regulation, while Section 4.2.5 relates to opticianry education and its regulation.

4.2.1 Structure of initial optometry education and its regulation

Although regulation of the optometric profession at post-licensure level is undertaken at state or province level in both USA and Canada, pre-licensure accreditation of academic programmes is undertaken at a national level and, with respect to initial optometric education, at a pan-national level across the USA and Canada. In the USA, the accrediting bodies for optometric first professional degree programmatic education derive its authority from recognition by the US Department of Education (USDE) and the Council on Higher Education Accreditation (CHEA). Accreditation is defined as the process of self-study and external review which assures that an educational institution or program meets or exceeds the standards applicable to that program. Accreditors not only determine whether minimum standards are met, but also promotes continuous quality improvement. Accreditation in the USA is basically a private, voluntary process, but accrediting decisions are considered in many formal actions—by govenmental funding agencies, state licensing boards, scholarship commissions, foundations and potential students.

Professional Optometric Degree programmes are accredited by the Accreditation Council on Optometric Education (ACOE) in both Canada and the USA. The ACOE is a self-regulating accreditation board, made up of three optometric practitioners, three educational representatives, two state regulatory board members, one optometric technician and two members of the public. The professionals on the board are nominated by the American Optometric Association (AOA), the American Regulatory Board of Optometry (ARBO) and the Association of Schools and Colleges of Optometry (ASCO).

In the USA and Canada optometry education is currently provided as a four or five-year post-graduate Doctor of Optometry (OD) degree, undertaken following on from at least three years of undergraduate study.

- There are twenty one professional optometric degree programs that hold an accreditation status in the USA and Puerto Rico and two in Canada[30]. OD qualifications from accredited Canadian universities are recognised as domestic qualifications in the USA and vice versa.[31]

[30] https://www.aoa.org/Documents/students/od_directory_2017_07_21.pdf
[31]The exception is Massachusetts College of Pharmacy and Health Sciences which is currently not fully accredited by ACOE https://opto.ca/becoming-a-doctor-of-optometry

- The final year of most OD courses in the USA and Canada is conducted in clinical practice and externships[32] across a range of settings, including primary and secondary care and hospital settings.

4.2.2 Approach to regulation and requirements of initial optometry education

ACOE takes a broadly outcomes-based approach to regulation, however it specifies inputs where the board considers that these are essential to maintain a good outcome from education. Education providers are expected to develop their own mission, goals and objectives and to set out to the ACOE how and why they believe that their programme meets the standards that have been set.

ACOE recently published updated OD programme standards, together with a crosswalk between the old and new standards[33]. The process of revising the standards began in 2015. A number of evidence strands were sought, including:

- An online survey focusing on whether the existing standards were critical in assessing an OD programme and whether they were clear and if not, what needed to be clarified.
- A stakeholder workshop to which all of the accredited education providers, AOA, ASCO, the National Board of Examiners in Optometry (NBEO) and the Department of Veterans Affairs were invited to discuss the feedback from the survey and provide their own recommendations about the new standards.

The findings from these consultations were considered by the professional review committee and new draft standards were drawn up and distributed to interested parties and the general public for comment. Following the review of the comments received the new standards were adopted.

There are now eight education standards[34] which relate to:

- Mission, goals and objectives;
- Curriculum;
- Research and scholarly activity;
- Governance, regulation, accreditation, adminstration and finance;
- Faculty;
- Students;
- Facilities, equipment and resources; and

[32] An externship is a clinical education rotation in a setting outside of the academic environment, this may include optometry practices, primary healthcare settings and hospital settings
[33] https://www.aoa.org/optometrists/for-educators/accreditation-council-on-optometric-education/accreditation-resources-and-guidance/optometric-degree-programs-
[34] ACOE, *Professional Optometric Degree Standards* (July 2017)

- Clinic management and patient care policies.

The key changes between the 2009 and the 2017 standards identified by ACOE are:

- A greater focus on 'independent practice' which should reflect the scope of practice that has been approved for optometrists in any state or province the USA and Canada.
- Maintaining high rates of post-graduation registration in the optical profession.
- Stricter definitions of externships as following on from initial clinical instruction and practice, requirements for more rigorous selection of externship sites and definitions of learning outcomes for externships.
- Greater transparency for students and a standardised approach to publishing course outcomes so that students are able to make informed choices about their place of study.

In addition, the requirement for interprofessional knowledge and capabilities was strengthened, which reflects a broad trend across health professional education in the USA.

Some other changes reflected expectations that the accrediting body had always held in relation to optometry education but which had not previously been explicitly described in the standards, for example:

- Specific requirements for the selection of students into OD programmes, to ensure they have the necessary qualities to become 'competent doctors of optometry'.
- Requirements for all OD curricula to occupy at least four academic years and for all OD programmes to be offered by autonomous units organised as schools or colleges of optometry.
- More specific examples of evidence in relation to faculty accessibility to optometry students and requirements in relation to the maintenance and repair of optometric instruments and technology infrastructure on campus.

The ACOE recognise that standards may need to be revised and updated before the next comprehensive standards review. There is a procedure to monitor standards through the process of the regular site visits that are conducted in educational institutions as part of the accreditation and reaccreditation process. Following each visit and evaluation form is completed which monitors whether the standards are difficult to assess or interpret. Any standards that are judged to require revision are reviewed and may be revised and reissued on a rolling basis.

4.2.3 Content and delivery of initial optometry education

The accreditor's perspective

According to ACOE, the following themes were important factors in the development of the new standards:

- *Increased scope of practice* and the potential for scope of practice to change again in the future. The requirement in the new standards for students to be ready for 'independent

practice' addresses both the current scope of practice and is flexible enough to incorporate and new developments prior to the next comprehensive review.

- A requirement for *evidence-based practice* and a continual learning culture, because optometry is a rapidly changing profession
- *Interprofessional working*, as part of a general trend in the health professions

While the accrediting body does not specify pedagogic approaches, it requires optometry schools to justify the educational approaches that they take, in terms of meeting the educational outcomes that are specified in the standards. In practice a range of different learning techniques are used across optometry schools.

> *"It is important to be a life-long learner and not just to stick to what you learned in optometry school throughout your career"* (Joyce Urbeck, Director ACOE)

Findings from the academic literature and interviews

For the past 40 years optometry in the USA and Canada has had a wider scope of practice than many other jurisdictions, with greater emphasis on therapeutic procedures, pharmacology and techniques for examining the eye. Recently, there has been further extension of the scope of practice for the optometric profession in certain US states and Canadian provinces[35]. There are also expected to be further increases driven by new technology which makes it easier to conduct examinations and provide treatments that would once have had to be undertaken by opthalmologists or in specialist clinical settings:

> *"With the increasing automation of clinical techniques I can't see any reason why the scope of optometry practice shouldn't continue to expand over the coming years into, for example, corneal collagen cross-linking to treat keratoconus."* (Prof. Mark Bullimore, Dean of Southern California College of Optometry at Marshall B. Ketchum University)

Some states allow optometrists to perform some surgical procedures after receipt of the OD degree, while some advanced skills remain post-qualification specialties. OD programmes are responding to these changes by teaching a broader range of competencies and clinical skills to pre-qualification students. However, this increased scope of practice brings with it new pressures on the academic curriculum. Institutions can find it challenging to fit in enough teaching hours and sufficient ptient encounters to ensure students are able to independently practice all of the basic optometrical competencies in the new scope of practice.

[35] In certain states licensed optometrists are permitted to deliver certain injections and to prescribe certain restricted medicines, although the scope of practice varies by state and province. Oklahoma, Louisiana and Kentucky permit optometrists to conduct some laser surgeries as well as removal of lesions, cysts and chalazia from the eyelid, Manitoba and Alberta in Canada permit minor surgery to the eyelid. Those states and provinces with the widest scope of practice tend to be more rural and to have a shortage of ophthalmologists in some areas.

> *"We are currently conducting a curriculum review and are looking at the possibility of dropping the summer vacation and adding another term of teaching at the end of the second year so that we can fit everything in"* (Prof. Lyndon Jones, University of Waterloo)

Interprofessional education (IPE) for optometry students is extensively explored in the academic literature[36] and is also central to ASCO's 2011 report, *Attributes of Students Graduating from Schools and Colleges of Optometry*[37]. ASCO is a founding member of the Interprofessional Education Collaborative (IPEC) which includes representation from 20 associations of schools of the health professions. IPEC published *Core Competencies for Interprofessional Collaborative Practice*[38] in 2016 and this has been endorsed by ASCO. IPEC, and indeed much of the academic literature, cites the World Health Organisation's call for greater IPE as a key motivator and catalyst for change in health professional education[39]. However, there can be barriers to effective implementation. The academic literature cites some of the practical barriers in effective delivery of IPE, including difficulty in co-ordinating timetables across disciplines, logistical issues where campuses are geographically distant and a lack of standardised tools to assess progress[40].

Interprofessional education: effects on professional practice and healthcare outcomes[41]

This systematic review reports on 15 studies exploring the effectiveness of interprofessional education. Although these studies reported some positive outcomes, it was not possible to draw generalisable inferences about the key elements of IPE and its effectiveness. The report suggests that to improve the quality of evidence relating to IPE and patient outcomes or healthcare process outcomes, more research is needed to assess the effectiveness of IPE interventions compared to separate, profession-specific interventions; RCT, CBA or ITS studies with qualitative strands examining processes relating to the IPE and practice changes are required; and cost-benefit analyses should be undertaken.

The rapid pace of change in the optometric and wider medical sector has created a fresh emphasis on academic institutions to provide optometry students with the research skills to seek out the latest evidence on clinical practice and assess its quality in order to support clinical decision-making and critical thinking.

[36] The Journal of Optometric Education devoted an entire issue to the topic of interprofessional education in 2015: https://journal.opted.org/optometric-education-volume-40-number-3/
[37] https://optometriceducation.org/files/2011_AttributesReport.pdf
[38] https://optometriceducation.org/wp-content/uploads/2017/01/IPEC-2016-Updated-Core-Competencies-Report__final_release_.pdf
[39] World Health Organisation (WHO), *Framework for action on interprofessional education & collaborative practice. Geneva: World Health Organisation* (2010) *http://whqlibdoc.who.int/hq/2010/WHO_HRH_HPN_10.3_eng.pdf*
[40] See *Optometric Education*: Volume 40 Number 3 (Summer 2015) for a selection of studies exploring the implementation of interprofessional education in O.D. courses
[41] Reeves et al., 'The effectiveness of interprofessional education: key findings from a new systematic review' in *Journal of Interprofessional* Care (May 2010,Volume 24(3))

New teaching techniques and modes of learning are being explored in academic settings. These include techniques such as active learning, team-based learning and problem-based learning, online problem-solving and simulations.

University of Waterloo approach to introducing new teaching methods

A faculty member from the Optometry School at the University of Waterloo has undertaken an M.Sc. in Health Sciences Education at McMaster University. This staff member supports the curriculum development of the OD course and the introduction of new teaching methods, such as Team Based Learning. Although the university fully supports the development of new teaching approaches, there are challenges in delivering 'best practice' learning experiences because this typically requires a lower staff to student ratio and may also require more time than traditional teaching methods.

4.2.4 Quality Assurance of initial optometry education

Accreditation and quality assurance of providers

ACOE develops and publishes standards for programmes to be accredited and for existing programmes to be periodically re-accredited[42]. In order to apply for accreditation the programme directors must engage in a process of self-study and submit this with a letter of application for accreditation. A programme of site visits is conducted as part of the accreditation or re-accreditation process, during which time third-party comments are also considered. During the site visits the self-study process is validated by a team of evaluators who conduct interviews with staff and students, reviewing records and files and assessing the facilities available. Following this process the programme's accreditation status is agreed at a meeting of the ACOE board and published online. According to ACOE, there has been some discussion in the USA of the potential to move towards a risk-based approach to quality assurance, but this has not been implemented. However, programs are monitored annually throughout the accreditation process, and if a concern is noted, certain programs may be required to submit progress reports or undergo an on site visit before the regularly scheduled eight year period of accreditation.

Student selection

All accredited institutions in the USA use a centralised admissions portal[43] for students applying to study OD courses. All accredited course providers in the USA and the University of Waterloo in Canada require applicants to undertake a standardised Optometry Admissions Test (OAT) and provide their test scores as part of the application process[44]. Most courses also require a face-to-face interview, evidence of work experience or shadowing in an optometry practice and minimum grade point averages in a range of mandatory undergraduate courses.

[42] Accreditation lasts no longer than 8 years
[43] The portal is known as 'OptomCAS': http://www.optomcas.org/
[44] http://www.ada.org/en/oat

Asessment of students prior to qualification

In addition to successfully graduating from a Doctor of Optometry course, optometry students in the USA and Puerto Rico are required to pass the National Board of Examiners in Optometry (NBEO) test to be eligible for licensure. This is a three-part test, with applied science, clinical decision-making and practical exams, and is usually undertaken in the third and fourth year of study. In addition, several states require a bespoke examination or examinations in order to obtain a license to practise[45].

The Optometry Examining Board of Canada (OEBC) administers the equivalent exam in Canada, which includes a written and a practical element. The format of the practical exam changed in 2017 and is now an Objective Structured Clinical Examination (OSCE). In addition to passing this exam, optometrists are required to obtain licensure from the province in which they wish to practise, which may entail undertaking additional examinations[46].

4.2.5 Dispensing optics initial education

This section relates to dispensing optics (known as opticianry in the USA and Canada). This is an entirely separate field to optometry in the USA and therefore this section is a self-contained description of opticianry education and its regulation, including accreditation and quality assurance.

Although there are similar structures and processes for accreditation of formal opticianry courses in the USA and Canada, the accreditation process is managed separately. This is because opticians are more closely regulated across the board in Canada than in the USA.

The requirement for formal qualifications in order to practise as an optician in the USA varies by state. The Commission on Opticianry Accreditation (COA) accredits 18 opticianry programmes in 14 states however completion of these courses is not a requirement for registration in any US state or territory. Twenty-seven states have no licensing requirements to practise as an dispensing optican (known locally as optician), although the Opticians Association of America states that most opticians have a High School Diploma or General Educational Development qualification (GED), followed by an on-the-job training programme or apprenticeship.[47]

Canadian opticianry courses are accredited by the National Association of Canadian Optical Regulators (NACOR), which is a national body representing optical regulators from all the Canadian provinces. NACOR provides a competency framework for dispensing opticians which is adhered to by all Canadian provinces and informs the content of opticianry courses in Canada[48]. In order to become a licensed optician in Canada it is necessary to complete an opticianry programme at an

[45] For individual state requirements see: http://www.optometry.org/state_requirements.cfm
[46] One example of this is the Ontario Optometric Jurisprudence Examination https://www.collegeoptom.on.ca/register-with-college/registration-faq/#ooje
[47] http://oaa.org/opticianry-defined/becoming-an-optician
[48] This document sets out the approach that NACOR took in developing their latest competency framework: http://www.nacor.ca/my_folders/competencies/development_of_national_competencies_document.pdf and this document provides the latest competencies: http://www.nacor.ca/my_folders/Competencies/NACOR_approved_Competencies_April2013.pdf

accredited educational institution. There are eight colleges in Canada providing opticianry programmes. Programmes are offered full-time, part-time, or through online study and range in length from one to three years for completion depending on the institution.

Most states with that operate licensing for opticians require one or a combination of a state exam, mandatory CPD, and satisfactory completion of the American Board of Optometry (ABO) basic exam and the National Contact Lens Examiners (NCLE) exams and/or the National Opticianry Competency Examination (NOCE) which are also administered by ABO.

In nine of the ten Canadian provinces, graduates must also pass a national examination administered by the National Association of Canadian Opticianry Regulators (NACOR) before being registered to practise. Quebec is the only province that does not recognise this examination[49].

We have not been able to identify any further evidence on patterns or trends in initial opticianry education in the USA or Canada.

4.2.6 Looking to the future

Accreditation of Higher Education has been scrutinised recently in the USA as the Higher Education Act of 1965 is currently due to be reauthorised. The reauthorisation debate in the Senate and House of Congress has raised questions about the relevance and quality of accrediting bodies in higher education, including, on the one hand, whether they do enough to ensure the quality of the curricula and teaching offered and, on the other hand, whether their oversight of these curricula stifles innovation[50].

In addition, higher education comes under the remit of the US President, Donald Trump's 'Executive Order 13777 on Enforcing the Regulatory Reform Agenda'[51]. The USDE is leading a Taskforce in response to that Executive Order. The CHEA has recently submitted a written response[52] and policy paper to the USDE's call for comments on the Regulatory Reform Agenda, arguing for a reduction in accreditation regulation and a move towards an outcomes rather than compliance-based approach[53].

[49] Opticianry students who have undertaken their studies in Quebec do not require a national examination in order to practise in Quebec, but those who have qualified in the rest of Canada must undertake a jurisprudence examination in order to be granted a license to practise. http://opticien.qc.ca/fr/main-nav/devenir-opticien-ordonnances/opticien-autres-provinces/ (note: source is in French)
[50] For example, the Senate Task Force on reauthorization produced a report that was critical of the *"micro management of the accreditation process"* https://www.help.senate.gov/imo/media/Regulations_Task_Force_Report_2015_FINAL.pdf, The 'Innovation in Accreditation Act' was proposed to the House of Representatives on 25 September 2017 https://byrne.house.gov/sites/byrne.house.gov/files/Byrne%20Legislation%20-%20Accreditation.pdf
[51] https://www.whitehouse.gov/the-press-office/2017/02/24/presidential-executive-order-enforcing-regulatory-reform-agenda
[52] http://www.chea.org/userfiles/uploads/USDE-letter-092017.pdf
[53] http://www.chea.org/userfiles/Occasional%20Papers/Regulatory-Relief.pdf

4.3 South Africa

4.3.1 Mechanics of initial education and its regulation

South Africa has an integrated approach to health professional regulation. There is one overarching body, the Health Professionals Council for South Africa (HPCSA), for regulation of all health professions registered with them. Within that, there are semi-autonomous professional boards which oversee health professional registration, education, continuing professional development and standards of practice. The sub-board of the HPCSA with responsibility for regulation of dispensing optics and optometry is the Professional Board for Optometry and Dispensing Opticians (PBODO).

Students of dispensing optics and optometry must register with the board as a student from their first year of study. The student registration provides students with a license to practise under supervision, recognising that practical experience is a very important part of their training. Upon qualification graduates must apply to convert their registration into qualified practitioner status.

There is one educational institution in South Africa which offers a National Diploma in Dispensing Opticianry[54] and four which provide a registered Bachelor Degree in Optometry[55]. The National Diploma in Dispensing Opticianry is a three-year course, comprising two years of classroom-based theory learning and a third year of in-service training. The Bachelor Degree in Optometry is currently a four-year course.

4.3.2 Approach to regulation and requirements of initial education

The PBODO comprises a mix of representatives from the professions and educational institutions, government and community oversight.

- The composition of the PBODO is set out in government legislation[56] and its aim is to reflect both the professional expertise required to effectively regulate the profession and the principles of transparency, equality and fairness upheld in the South African constitution[57].
- The Board includes professional representatives – within which there are quotas to ensure representation from "designated groups"[58]- a representative of educational institutions accredited by the board nominated by Higher Education South Africa (HESA), a representative of the Department of Health and two community representatives.

[54] Cape Peninsula University of Technology
[55] University of Limpopo; University of KwaZulu - Natal; University of Free State; University of Johannesburg
[56]Constitution of the Professional Board for Optometry and Dispensing Opticians, Regulation No. R. 1250 of 28 November 2008
http://www.hpcsa.co.za/downloads/rules_reg_constitution/medical_technology_constitution.pdf
[57] The full text of the constitution of South Africa can be found here:
http://www.justice.gov.za/legislation/constitution/SAConstitution-web-eng.pdf
[58] These are sub-sections of the population that have experienced disadvantage in the past e.g. women, people of colour, disabled people

PBODO takes an outcomes based approach to regulation: it sets the outcomes for higher education institutions and the institutions take responsibility for delivering those outcomes. PBODO sets minimum standards of competencies and defines the exit level outcomes based on knowledge, skills, attitudes and ethics. These are subdivided into smaller sub-outcomes with criteria for assessment. This gives educational institutions autonomy in curriculum design and delivery and in the design and delivery of assessments.

PBODO is currently redrafting its Exit Level Outcomes for Optometry. The current outcomes are modelled on the Australian approach, amongst others, and include high-level outcomes, followed by assessment criteria, which are also relatively broad, and also detailed 'critical outcomes' or 'performance criteria' which specify ways in which the outcomes can be demonstrated.

In addition to providing an outcome framework for educational institutions to adhere to in their curriculum design and delivery, an education committee of the PBODO meets on a six-monthly basis to discuss outcomes.

4.3.3 Content and delivery of initial education

The regulator's perspective

The regulatory perspective in South Africa is closely aligned with the profession and educational institutions, due to the constitution of the PBODO board. Therefore the themes identified in this section reflect this combined perspective.

> *"The Council and education are working side by side to get the profession up to standard"* (Anthea Pinto-Prins, PBODO member and Junior Lecturer at the Department for Ophthalmic Sciences, CPUT)

In the past the PBODO has looked internationally to specify the outcomes for the dispensing optics curriculum. However, in view of the specific public health challenges faced in South Africa, the focus has recently moved to competencies that reflect local community requirements e.g. screening/pre-screening for common pathologies, checking optical prescriptions for refractive error[59] and referral pathways.

The PBODO is currently examining the structure of the whole ophthalmic profession with a view to articulation and progressing ladders of progression and by considering the distinct competencies of each profession. This is taking place in the context of increased scope of practice for optometrists, who are now licensed to provide diagnostics and therapeutics to patients, on completion of the appropriate training and practical experience. The rationale for this change was the assessment of need in the population and access to healthcare. There are only circa 300 ophthalmologists in South Africa for a population of over 55 million.

[59] Because ophthalmic technicians are not a regulated profession in South Africa, there can be issues in the quality of lens manufacture and preparation

Therapeutic training and practical experience is now being incorporated into all bachelor's degrees in optometry and education institutions are undergoing a re-curriculation process. This process is outward facing and involves wide consultation with the profession, public, government and a review of the available evidence of best practice in education and optometric technologies and techniques.

> *"We are outward looking when we design our curriculum, we don't just ask our academic staff what they think, we are looking for outcomes that are global"* (Pat Von Poser, PBODO Vice-Chair and Head of Department for Optometry at the University of Johannesburg)

As a result of the new competencies that are being introduced into the curriculum, PBODO are now looking at a 4+1 structure of optometry qualifications, with different exit levels and a final year integrated with therapeutics outcomes. This may entail optometry becoming a professional master's degree rather than a bachelor's degree. It also requires new approaches to recording competency in managing therapeutic relationships with patients, for example through logbook approaches to demonstrating competency.

Multi-disciplinary approaches to care and research were also identified as a key area of development and challenge for eyecare educators. There is a need for greater recognition among wider health care professionals that medicines can have impact on vision and a need to work across disciplines to ensure the best outcomes for patients. One university in South Africa is working closely with ophthalmology but there are challenges to implementing interprofessional education (IPE), especially where the courses are taught in different institutions.

Further trends that were identified by the members of PBODO are:

- Requirements for constant continuing professional development and skills in identifying and implementing evidence-based practice.
- Communication skills to consult properly and effectively with patients.
- Blended learning – most universities in South Africa use the blackboard system already, and development of blended courses is already underway.

> *"The opportunity exists for specialist teachers from the UK to collaborate and share ideas using new technologies to deliver lectures"* (Pat Von Poser, PBODO Vice-Chair and Head of Department for Optometry at the University of Johannesburg)

What the academic and other literature shows

The optical education about South Africa is very sparse. Only five articles were found and a narrative description of these studies is provided below.

- Two studies provide overviews of the history and current approach to optometry education in two different South African universities (Mashige, 2009[60] and Oduntan, 2006[61]) and another provides a broader historical perspective on optical education in Africa in general (Oduntan et al. 2013)[62].
- Other studies address practical and clinical skills development (Hansraj, 2009)[63] and student attitudes to community service to extend healthcare provision to communities that are currently underserved (Mashige et al., 2013)[64].

4.3.4 Quality assurance of initial education

Accreditation and quality assurance of providers

Quality assurance of education providers is provided by the PBODO through accreditation and re-accreditation assessments, which take place every five years. These include written submissions, evidence of curricula, site visits and pre-arranged interviews with students, members of the public and stakeholders. Full accreditation is awarded to those institutions meeting all criteria, while partial accreditation indicates that improvement is needed in certain aspects of the curriculum or delivery of the course.

This accreditation process is overseen by the Higher Education Quality Committee (HEQC) which must be satisfied that PBODO's standards and methods of determining whether a particular qualification offered by a particular higher education institution meets the requirements for registration, membership or licensing of graduates. HEQC has published a Higher Education Quality Framework (HEQF) which sets minimum standards for compliance with qualification-type requirements that all education providers must adhere to in order to be registered.

In addition, the South African Qualifications Authority has a quality assurance role to play in ensuring the PBODO's quality assurance processes meet legal standards and all accredited courses also meet legal standards. All qualifications must be registered with SAQA and in order to be registered they must comply with policy and criteria for the development, registration and publication of qualifications and part-qualifications it sets, in consultation with the Higher Education Quality Council (HEQC).

Selection of students

[60] Mashige K, 'Optometric education at Westville: Past, Present and Future', in *S Afr Optom* (Volume 69(1), 2010)
[61] Oduntan A, 'Thirty years of optometric education at Turfloop (1975-2005): A historical and educational overview' in *S Afr Optom* (Volume 65(1), 2006)
[62] Oduntan et al., 'Optometric Education in Africa: Historical Perspectives and Challenges' in *Journal of Optometry and Vision Science*, (Volume 91: No. 3, 2013)
[63] Hansraj R 'The perspective of optometry students of the Phelophepa train regarding its role in developing experiential skills' in *S Afr Optom* (Volume 68(2), 2009)
[64] Mashige et al., 'Perceptions and opinions of graduating South African optometry students on the proposed community service' in *S Afr Optom* (Volume 72(1), 2013)

The HEQF sets minimum attainment standards for students to gain admission into higher education. Most optometry schools require a certain score in the Admission Point Score (APS) and for applicants to undertake the National Benchmark Test (NBT)[65] as part of the application process. The NBT is generally used to determine curriculum support requirements rather than as part of the selection procedure.

Assessment of students prior to qualification

Students are summatively assessed on their theoretical and clinical skills as part of their final examinations in their educational institutions. This is an integral part of the 'exit outcomes' approach used in the regulation of optical qualifications.

Objective assessment of clinical competencies is highly valued in the South African system, because it adheres to the principles of fairness and equality that are enshrined in the constitution and which run through all aspects of the education system. Therefore, external examiners are used to triangulate teaching staff assessments of students in practical and theoretical exams.

Only those students who pass specific exit competency assessments (e.g. diagnostics) according to the criteria set by PBODO are then qualified to practise in those areas of practice. Certain qualified optometrists are not permitted to undertake diagnostics or therapeutic activities, but it is possible to upgrade registration on successful completion of accredited CPD courses.

PBODO has been considering the possibility of implementing National Board Exams in South Africa, following qualification but this has not been taken forward at this stage. After looking at the NBEO exam in the USA, the board concluded that it would require a strong IT system and significant resources to devise and manage the examination process, which is not currently available in South Africa. Professional Board exams are however conducted for 'foreign qualified optometrists' wishing to practise in South Africa.

4.3.5 Looking to the future

Dispensing opticians have requested extensions to their scope of practice, but this has so far not been granted. However, in a bid to achieve pathways of progression for opticians, CPUT is working on developing a Bachelor of Health Sciences in Opticianry.

In addition to the extension of scope of practice, open access to optical education has been identified in our interviews as an emergent theme in South Africa. The driver for this is the World Health Organisation's call for greater access to health professional education to address the issue of under-supply of health professionals in low and middle-income countries[66]. Advances in learning technologies and the prevalence of blended learning could support this type of approach and extend access to the health professions to new students.

[65] http://www.nbt.ac.za/

[66] Heller et al., 'Capacity-building for public health: http://peoples-uni.org', *Bulletin of the World Health Organisation,* (Volume 85: no 12, December 2007)

Telemedicine is another theme that has strong resonance in South Africa because it could allow optometrists to conduct diagnostics and therapeutics in mobile clinics in areas that do not currently have access to healthcare. There are both educational and regulatory implications to this technology, to ensure quality standards are upheld.

5. Initial education for other UK health professions

5.1 Medicine

5.1.1 Mechanics of initial education and its regulation

The General Medical Council (GMC) regulates all stages of doctors' training and professional development in the UK. During the initial stages of education and training, it does this by[67]:

- For undergraduate education:
    - setting standards that must be met in teaching and assessing students within undergraduate degrees;
    - setting out the skills and behaviours that students need to have learned to complete the course; and
    - accrediting and monitoring schools.
- For initial training following graduation:
    - setting standards for the Foundation Programme, including what level the doctor must reach by the end of the programme;
    - setting outcomes for provisional registration at the end of the first year of the Foundation Programme; and
    - approving the curriculum for the Foundation Programme which includes competencies to be achieved in the whole programme.

Medical degree courses in the UK typically last five years and there are currently 32 bodies accredited to provide medical degrees in the UK[68]. Foundation Training following medical school is a two-year programme where graduates undertake terms in various specialties, under the co-ordination, supervision and monitoring of a regional post-graduate training body.

Graduates of medical school need to apply for provisional registration with the GMC in order to enter the first year of Foundation Training (F1) and then to apply for full registration ahead of commencing F2[69]. Following the Foundation Training years, junior doctors will embark on at least three years of further specialty training under supervision in order to join the GMC's GP or specialist register[70].

[67] http://www.gmc-uk.org/education/27007.asp
[68] http://www.gmc-uk.org/education/undergraduate/awarding_bodies.asp
[69] http://www.gmc-uk.org/doctors/registration_applications/join_the_register.asp
[70] http://www.gmc-uk.org/doctors/medical_register.asp

5.1.2 Approach to regulation and requirements of initial education

Updated GMC standards for the management and delivery of both undergraduate and postgraduate medical education and training were published in July 2015 and came into effect in January 2016, following a review of the GMC's approach to medical education and training. *Promoting Excellence*[71] replaced what were previously separate standards for the undergraduate and postgraduate stages of education and training[72] with a single, integrated articulation of the GMC's expectations. The new standards have been designed to bring greater clarity, harmonisation and alignment across all stages of education and training. They underline the importance of providing a supportive environment based on evidence, including from the GMC's national training surveys and its Regional Liaison Teams, of variable experiences of training. As a result, these standards place greater emphasis on the GMC's expectations regarding aspects such as the sufficiency of clinical placements, time provided for study, and pastoral care.

The standards are structured around five themes[73]:

- learning environment and culture;
- educational governance and leadership;
- supporting learners and educators; and
- developing and implementing curricula and assessments.

The themes are prefaced by an explicit articulation that 'patient safety is the main priority'. The Professional Standards Authority (PSA) has commented on the prioritisation of patient safety in these standards:

> *"These standards address recommendations from the Berwick Review[74] around ensuring medical education and training focuses on patient safety and quality improvement. They are designed to ensure that patients' safety, experience and quality of care, as well as fairness to learners based on the principles of equality and diversity, lie at the core of teaching and training. The standards set out how organisations must promote and encourage a learning environment and culture that allows learners and trainers to raise concerns about patient safety, and the standard of training, without fear of negative consequences."*[75]

[71] GMC, *Promoting Excellence* (July 2015)

[72] GMC, *Tomorrow's Doctors* (September 2009) and *Trainee Doctors* (February 2011)

[73] GMC, *Promoting Excellence* (July 2015)

[74] Professor Don Berwick, an international expert in patient safety, carried out a review into patient safety following the publication of the Francis Report into the breakdown of care at Mid Staffordshire Hospital. Reference: Berwick D, *A promise to learn – a commitment to act. Improving the Safety of Patients in England* (2013)

[75] Professional Standards Authority, *Annual Review of Performance 2015-16 - GMC*

Following the launch of *Promoting Excellence,* a series of inter-related postgraduate reforms were published in May 2017. Central to these reforms are the GMC's new standards for postgraduate curricula, *Excellence by Design*[76].

As mentioned, the GMC sets broad standards and requirements for postgraduate curricula which, for the Foundation Programme, are developed by the Academy of Medical Royal College and approved by the GMC and, for GP and specialty training by the relevant Royal colleges and faculties, again subject to approval by the GMC. As with undergraduate curricula, there has been a shift towards a more outcomes based approach to postgraduate curricula. To this end one of the requirements in the new curricula standards is that in developing curricula, colleges and faculties must integrate the *Generic Professional Capabilities Framework*[77] (GPC). The new framework, developed jointly by the GMC and the Academy of Medical Royal Colleges, originally covered the outcomes for postgraduate specialty training, but has also been aligned with the GPC. The GPC framework will also be reflected in the GMC's *Outcomes for graduates*, which at the time of writing are being reviewed and are subject to a public consultation.

In this context, the GMC's *Outcomes for Graduates*[78] outline the GMC's expectations for graduates across three broad domains: scientific knowledge and scholarship, practice and professionalism. The professional requirements include the ability to behave according to ethical and legal principles; reflect, learn and teach others; work and learn effectively as part of a multi-professional team; and protect patients and improve care. The development of these general professional skills is believed to be a particular priority for initial education and training:

> *"Clinical skills are obviously important but students and doctors at all stages of medical education and training must incrementally develop the professional knowledge and skills they need to deliver safe, effective and compassionate patient care, to work well with colleagues and understand the complexity of the service environment they are operating within."* (Mark Dexter, Head of Education Policy at the GMC)

The standards for education and training set out in *Promoting Excellence* underline the importance of providing a supportive environment based on evidence, including from the GMC's national training surveys and its Regional Liaison Teams, of variable experiences of training. As a result, these standards place emphasis on the GMC's expectations regarding aspects such as the sufficiency of clinical placements, time provided for study, and pastoral care.

The requirements regarding patient safety in the standards for education and training have also been informed by previous work the GMC has undertaken with the Medical Schools Council (MSC) on this theme. A joint report produced in 2015[79] set out the organisations' shared commitment to

[76] GMC, *Excellence by design – Standards for postgraduate curricula* (May 2017)

[77] GMC, *Generic professional capabilities framework* (May 2017)

[78] GMC, *Outcomes for graduates* (updated December 2016)

[79] GMC and MSC, *First, Do No Harm – Enhancing patient safety teaching in undergraduate medical education* (September 2015)

ensuring patient safety in undergraduate medical education and highlighted the need to address several areas including interprofessional working, and the process of clinical governance and quality improvement.

5.1.3 Content and delivery of initial education

The regulator's perspective

Ascertaining generalised patterns and trends in the content and delivery of medical education in the UK is challenging as the approach taken by individual schools and training providers varies, in keeping with the intention of the regulation which is to "*allow sufficient flexibility to enable organisations to manage training locally, to better reflect their educational and service capacity and capability."*[80]

However, the GMC does monitor broader patterns and trends in the experience of receiving or providing medical education and training. Each year, the GMC publishes its review of the state of medical education and practice in the UK. The headline finding of the latest such report[81] is that systems of healthcare across the UK are increasingly struggling with the dual pressures of increased demand from a growing number of people living with multiple, complex, long-term needs combined with up to eight years of severely constrained NHS funding. The GMC reports on evidence that *"the pressures on the system are having a direct impact on the education and training environment".* For example, while its most recent national training survey[82] found that most doctors in training are broadly satisfied with their experience, a number of issues of concern were identified including pressure for junior doctors to work beyond their allocated hours and trainers not always being able to allocate sufficient time specifically for training. The more explicitly articulated requirements in the GMC's standards for education and training around supporting both learners and educators are part of its response to this, along with its quality assurance procedures (see next section).

The GMC also identifies and shares individual examples of good practice in medical education and training in an effort to help drive up standards. It does this in a specific section on its website[83] where it highlights a range of examples, categorised by the five themes in its standards for education and training. The *First, Do No Harm* joint report with the MSC[84] also cites a number of case studies particularly of schools who have aligned their safety teaching with the World Health Organisation Patient Safety Curriculum Guide[85], a recognised model for good practice in this area of teaching.

What the academic literature shows

[80] GMC, *Excellence by design – Standards for postgraduate curricula* (May 2017)
[81] GMC, *The state of medical education and practice in the UK* (2016)
[82] GMC, *Training environments 2017: Key findings from the national training surveys* (2017)
[83] http://www.gmc-uk.org/education/27707.asp
[84] GMC and MSC, *First, Do No Harm – Enhancing patient safety teaching in undergraduate medical education* (September 2015)
[85] World Health Organisation, *Patient Safety Curriculum Guide - for Medical Schools* (2009) and *Multi-Professional Edition* (2011)

The recent academic literature on approaches to initial education and training in UK medicine is vast but tends to focus on very specific examples of pedagogy, often in a specific setting, and the body of literature as a whole is extremely varied. This makes identifying general patterns and trends within the academic literature extremely challenging. However, after grounded thematic analysis across all of the studies identified, the following themes were found to be most prevalent overall:

- Practical and clinical skill development;
- Developing general professionalism; and
- Use of new techniques and technology in teaching.

An example of a high quality study within each of these categories is included below for illustrative purposes:

The effectiveness of gynaecology teaching associates in teaching pelvic examination[86]

This study sought to assess whether teaching female pelvic examinations using gynaecological teaching associates (GTAs) improves the competence, confidence and communication skills of medical students. A randomised controlled trial was undertaken with 492 final year students in 10 University of Birmingham affiliated teaching hospitals in the UK. Self-reported confidence was higher in students taught by GTAs compared with those taught on manikins. Competence was also higher in those taught by GTAs when assessed by an examiner and by a GTA. The study concludes that GTA teaching of female pelvic examination at the start of undergraduate medical student O&G clinical placements improves their confidence and competence compared with conventional pelvic manikin based teaching.

Assessing emotional intelligence training and communication skills[87]

A pilot study with a quasi-randomised controlled design was employed with self-report assessments conducted at baseline and post-intervention following a seven-month training programme. Medical students based at a UK-based medical school participated in the study, and 36 volunteer students were recruited to the control group with 50 students randomly assigned to receive the intervention. The intervention group had significantly higher EQ-i change from baseline mean scores than the control group. The intervention group mean scores had increased across time, whilst the control group mean scores slightly decreased. The study concludes that EI developmental training workshops had a positive effect on the medical students in the intervention group.

[86] Janjua et al., 'The effectiveness of gynaecology teaching associates in teaching pelvic examination to medical students: a randomised controlled trial' in *European Journal of Obstetrics & Gynaecology and Reproductive Biology* (Volume 210, March 2017)

[87] Fletcher et al., *'A pilot study assessing emotional intelligence training and communication skills with 3rd year medical students'* Patient Education and Counselling (Volume 76, Issue 3, September 2009, pp.376-9)

Comparison of traditional face-to-face teaching with synchronous e-learning [88]

This study compares a traditional instructor-led lecture with synchronous e-learning (SeL) using otolaryngological emergencies teaching as an educational intervention. A randomised controlled trial was designed involving two groups of medical students attending an otolaryngology emergencies management lecture: one present face-to-face, and the other viewing the streamed lecture online. The primary outcome measure was improvement between pre-and post-lecture test scores. Secondary outcomes comprised the students' ratings of the lecture on a Likert-type scale. Students in both groups had improved test scores following the lecture. There was no difference in student ratings between the two groups for the usefulness of the lecture, interactivity and meeting educational needs. This study demonstrates that SeL may be as effective as face-to-face teaching in improving students' knowledge on the management of otolaryngological emergencies and highlights the potential utility of e-learning technology in undergraduate otolaryngology training.

5.1.4 Quality assurance of initial education

Accreditation and quality assurance of providers

The GMC has a multi-faceted approach to quality assurance that operates under a framework designed both to provide assurance that its standards are met and to promote excellence. There are a number of specific elements including:

- Approval of bodies that can award Primary Medical Qualifications (i.e. medical degrees that lead into registration with a licence to practise).
- Visits, which are risk-based, to individual providers as well medical schools and postgraduate organisations as part of regional or thematic reviews.
- A monitoring process which requires organisations to supply annual or scheduled reports about the education and training they manage. The reports are analysed and where issues are identified the GMC may then choose to implement enhanced monitoring provisions.
- Other evidence collection, including the national education and training surveys and data on the progression of doctors in training.

The GMC reports that the inadequate emergency care at North Middlesex Hospital, as identified by the Care Quality Commission,[89] was a turning point with respect to the GMC's approach to quality assurance of education and training. Evidence collected in a visit by Health Education England and

[88] Alnabelsi et al., 'Comparison of traditional face-to-face teaching with synchronous e-learning in otolaryngology emergencies teaching to medical undergraduates: a randomised controlled trial' in *Eur Arch Otorhinolaryngol.* (Volume 272(3), March 2015 pp.759-63)
[89] http://www.cqc.org.uk/news/releases/cqc-inspectors-find-emergency-care-north-middlesex-university-hospital-be-inadequate

the GMC in March 2016 raised serious questions about whether the hospital should retain training posts[90] and it led the GMC for the first time to consider using its statutory powers. The issues identified led to a strengthening of the GMC's communication and evidence sharing with other bodies concerned with quality assurance such as the CQC as well as NHS England, NHS Improvement and Health Education England.

Selection of students

Currently schools have flexibility to implement their own methods of student selection and the GMC does not set out particular requirements with respect to student selection methods. In addition to academic records, student selection methods may include aptitude tests; personal statements, essays and autobiographical submissions; references; Situational Judgment Tests (SJTs); Personality Assessment and Emotional intelligence; interviews and Mini-multiple interviews (MMIs); and Selection Centres. Medical schools are informed in this area by the Medical Schools Council's Selection Alliance[91].

The GMC has previously commissioned independent research to identify best practice in student selection[92]. This report found evidence that MMIs, aptitude testing, SJTs and selection centres are 'better' overall as a predictor of medical school attainment than traditional interviews, references and autobiographic reports. However, this report also acknowledges that there is less evidence on the relationship between different selection methods and students who go onto become good doctors. In addition, other studies[93] have found A Levels to be the best overall predictor of performance, suggesting that the evidence in this area is not clear-cut.

Assessment of students prior to qualification

Currently, each medical school is responsible for developing its own methods of assessment for its undergraduate students. However, some requirements for assessment are set out in its standards for education and training, *Promoting Excellence*[94]. For example, the standards state that "medical school curricula and assessments are developed and implemented so that medical students are able to achieve the learning outcomes required for graduates".

The GMC's also provides guidance in this area. Its most recent assessment guidance[95] highlights the importance that assessments are clearly linked to the GMC's *Outcomes for Graduates*, including that all outcomes are assessed and only those who meet these outcomes are permitted to graduate.

However, the GMC is now considering the introduction of a standardised licensing assessment (see below).

[90] http://www.gmc-uk.org/GMC_HEE_DOCUMENT_NMUH_July_2016_Final.pdf_66825868.pdf
[91] https://www.medschools.ac.uk/our-work/selection/msc-selection-alliance
[92] Cleland et al., *Identifying best practice in the selection of medical students* (November 2012)
[93] E.g. Leinster S, 'Selecting the Right Medical Student' in *BMC Medicine* (November 2013)
[94] https://www.gmc-uk.org/education/standards.asp
[95] http://www.gmc-uk.org/Assessment_in_undergraduate_medical_education___guidance_0815.pdf_56439668.pdf

5.1.5 Looking to the future

One of the main future developments expected in the GMC's approach to education and training relates to its plan to establish a UK-wide Medical Licensing Assessment (MLA)[96]. The GMC has defined the aim of the MLA as "*to create a single, objective demonstration that those applying for registration with a licence to practise medicine in the UK can meet a common threshold for safe practice".* A full consultation on its plans for the MLA closed on 30 April 2017. A report of the consultation findings was published in the Council papers for September 2017[97] and revised proposals in light of the consultation will go to Council for consideration in December 2017.

Subject to the outcome of this consultation and the view of its Council, the GMC envisages developing detailed plans with experts and partners, undertaking an extensive pilot and ultimately implementing the MLA fully in 2022.

Shorter term, the GMC also has plans to update the outcomes it requires of graduates and it is currently consulting on some proposed revisions[98] which are designed in part to tie the outcomes more closely into its *Generic professional capabilities framework*[99].

Whilst not strictly in scope for this report, which is concerned with initial education and training, for completeness it is worth mentioning that the GMC's other main area of future focus with respect to education and training is on reforming postgraduate training, particularly at the specialty stages. There is also a review underway in this area, the purpose of which is to ensure training becomes sufficiently flexible to enable doctors to change specialties or to care for patients beyond immediate specialty or subspecialty boundaries[100].

[96] http://www.gmc-uk.org/education/29000.asp
[97] https://www.gmc-uk.org/M05___Report_on_the_Medical_Licensing_Assessment_consultation.pdf_72007373.pdf
[98] http://www.gmc-uk.org/Outcomes_for_graduates_2017_v0.22_final_for_consultation.pdf_72053747.pdf
[99] GMC, *Generic professional capabilities framework* (May 2017)
[100] GMC, *Adapting for the future – A plan for improving the flexibility of UK post-graduate medical training* (2017)

5.2 Nursing

5.2.1 Mechanics of initial education and its regulation

The Nursing and Midwifery Council (NMC) is the nursing and midwifery regulator for the UK. The Nursing and Midwifery Order 2001 defines the NMC's role in the education and training of nurses and midwives. The NMC sets standards of education and training for the four countries within its jurisdiction. Its role is to ensure that all nurses and midwives on its register are able to provide safe and effective care to the public. While the NMC's remit spans nursing and midwifery, this chapter will focus exclusively on nursing education, as midwifery is not in scope for this report.

The minimum education threshold to become a registered nurse is the successful completion of a three-year undergraduate degree which must meet requirements set by the NMC. NMC specifies that following graduation newly qualified nurses should undertake a year of preceptorship, however this year is currently out of scope for the NMC's regulation of education and is considered to be an employment issue.

Pre-registration nursing education is divided into four fields of nursing practice (adult, children's, learning disability or mental health nursing), one of which must be selected at the point of entry to the programme that leads to successful graduates' application to the register and is then recorded as their field of nursing practice. There are 72 institutions in the UK currently offering undergraduate nursing degrees.

There are currently also requirements for nursing education under European Law, which the NMC and therefore approved education institutions must adhere to in order for UK nursing qualifications to be recognised across the EU. The NMC complies with the EU legislation for the minimum length of programme in years and hours and they must also comply with the required hours of theoretical and practice learning instruction which general care nursing (adult nursing) must adhere to. Within its standards the NMC also confirms the same number of programme hours for all remaining fields of nursing practice. Approach to regulation and requirements of initial education

Education is currently one of the top five priorities for the NMC Council[101] and it is currently focused on ensuring that regulation of education is proportionate, 'right touch'[102] and works together with other actors with a role in education. The NMC has traditionally taken an 'input' or 'process driven' approach to regulation, through detailed specification of educational standards and proficiencies[103], but this has been reported as being overly burdensome for providers of education. The NMC have embarked on strategic a 'Programme of Change for Education'[104] which has begun with redrafting its

[101] The NMC Council is the strategic governing and decision-making body for the NMC
[102] The concept of 'right touch' regulation is taken from; Public Standards Authority, *The Performance Review Standards, standards of good regulation* (2016)
[103] The Pre-registration Nursing Standards (2010) are still in force and represent this type of approach
[104] A summary of the programme and all draft proposals can be viewed on this web page: https://www.nmc.org.uk/education/programme-of-change-for-education/programme-change-education/

education and training standards, proficiencies for registered nurses and nurse and midwife prescribers so that they are outcome-focused.

> *"This is a radical reform, not more of the same. We are deconstructing with a view to reconstructing the right thing."* (Anne Trotter, Assistant Director: Education and Standards at the NMC)

The NMC ran a public consultation over the summer of 2017 into:

- new standards of proficiency for registered nurses;
- a draft education framework including requirements for education and training for nursing and midwifery education;
- programme requirements for pre registration nursing programmes
- Programme requirements for nurse and midwife prescribers
- Learning and assessment requirements
- a proposal to withdraw the NMC's existing standards for medicine management and
- a proposal to withdraw the current standards of proficiencies for nurse and midwife prescribers and replace them with the Royal Pharmaceutical Society's competence framework for all prescribers.

The results of the consultation are currently being analysed and a proposal for new standards will be presented to the NMC Council for approval in March 2018. Approved education institutions will adopt the new standards from September 2019. The programme of change will continue with new proficiencies and educational standards for midwifery, Specialist Community Public Health Nurses (SCPHN) that includes health visitors, school nurses and occupational health nurses, as well as a review of our specialist practice qualifications.

A key feature of the NMC's process in reviewing its regulation of pre-registration education has been a collaborative approach in working with other health regulators:

- In drafting the new education framework, the NMC adopted the structure of the General Medical Council's standards for medical education[105], adapting the content so that it is specific and relevant to nursing education.
- In developing the new proficiency standards for nurse and midwife prescribers, the NMC is proposing to adopt the Royal Pharmaceutical Society's competence framework rather than redrafting its own, because the Royal Pharmaceutical Society's standards are felt to be comprehensive, relevant and appropriate for their needs.

[105]GMC, *Promoting Excellence - Standards for medical education and training* (July 2015)

This approach also reflects the increased focus on interprofessional collaboration in health and care settings and changing scope of practice of the nursing and midwifery professions and is described by the NMC as *"the beginning not the end of this kind of regulatory co-operation".*

The NMC recognises that this new approach, whilst reducing the burden on academic institutions and their practice placement partners to comply with specific regulations, can be challenging to implement.

5.2.2 Content and delivery of initial education

The regulator's perspective

The nursing and midwifery professions have recently been challenged to review and reflect on its practice and values through public and political scrutiny. A number of national reports and reviews have provided this challenge which has been fed into the NMC's new approach to setting educational standards[106]. The standards drafting process has also taken into account numerous national policy and strategy documents and recent legislation[107]. Some key themes and developments in the content and delivery of education that the NMC has considered in the drafting process include:

- *Service user and public involvement:* the NMC has a duty to protect the public. What the public needs from nurses is at the centre of their education standards-setting approach. The new draft standards include explicit requirements to involve patients and the public in selection of students, assessment of practical skills and professionalism and informed consent, or withholding of consent to be treated by a student nurse as well as feedback processes where students have been involved in their care.
- *Person-centred care:* A number of strategic reports from across the UK[108] suggest that in future healthcare will be delivered in more community-based settings and that healthcare professionals will be increasingly supporting patient self-care especially in the case of long-term conditions. The NMC interprets its role in responding to these developments as ensuring that nurses and midwives are prepared to work across a range of settings and are able to support people, families and carers to self-manage care outside of large healthcare facilities.

[106] These include reports and enquiries into patient safety and quality of care, including: Francis (2013); Berwick (2013); Keogh (2013); Bubb (2014); as well as Health Education England, *Raising the Bar, Shape of Caring: A Review of the Future Education and Training of Registered Nurses and Care Assistants* (2015)
[107] These include: *The Health and Social Care Act* (2012); Department of Health, *The Public Health Outcomes Framework 2016-2019*, (2016); NHS England, *Five Year Forward View* (2014); Health Improvement Scotland, *Driving Improvement in Healthcare: Our strategy 2014-2020* (2014)
[108] Ibid

- *Interprofessional education:* there is evidence that multidisciplinary teams are more effective at delivering care[109] and several reports into failures in care highlight lack of effective team working and communication[110]. Multidisciplinary learning is therefore a key area of focus, especially in practice /clinical learning.
- *Increased scope of practice:* the NMC has started with what people will expect and need from the nursing profession now and in the future. Greater autonomy of nursing care in the person's home and closer to home will require leadership and strategic management of care, as well as the competence and authority to make diagnostic and therapeutic decisions about care, where this falls within their scope of practice.
- *Evidence based practice and critical appraisal skills*: *Raising the Bar,* in particular, stresses the importance of a research and learning culture and evidence based practice in delivering high quality and safe patient care[111]. The first pillar of the new draft educational standards is developing a 'learning culture', which is taken directly from the GMC's educational framework. This signals a clear intent to maintain nursing's status as a graduate profession, with a research and evidence based practice in line with other medical professions. The NMC's ambition is that nurses reflecting on practice and using evidence to inform their practice will not just respond to change, they will also bring change into the nursing profession.

The NMC explicitly stated that its new approach to outcomes-based standards means that it will not be specifying what approaches educational institutions should take, but rather focusing on outcomes, which can be achieved in a variety of ways. As such, the NMC does not regard its role as being to specify case studies of good practice or innovative models in nursing education but intend to disseminate this through communications and stakeholder engagement.

HEE has a specific role in highlighting excellent education and training programmes for students. Its report, *Raising the Bar*[112]*,* provides a number of case studies that it highlights as presenting interesting or good practice in a number of areas of nursing education. Among these there is a detailed study on a pilot model for collaborative learning in practice[113], the evaluation of which has now been published. This case study is presented in the context of improving practical clinical education in a variety of settings, including community and primary care settings, to allow nurses to experience integrated care delivery and a wide range of patient interactions:

[109] NICE's 'Better Care Fund' supports local integration of care based on evidence-based guidance and quality standards: https://www.nice.org.uk/news/feature/better-care-fund
[110] E.g. Francis (2013); Keogh (2013)
[111] Health Education England, *Raising the Bar, Shape of Caring: A Review of the Future Education and Training of Registered Nurses and Care Assistants* (2015), pp.57-58
[112] Hill et al., *Collaborative Learning in Practice (CLiP): Evaluation Report* (2016)
[113] *Ibid* p. 47

Collaborative Learning in Practice Model

The University of East Anglia set up a 'Real Life Learning Ward' to support day-to-day learning in practice. The approach uses peers and near-peers to coach nursing students, with the support of a mentor and Clinical Educator role to provide on-site support and guidance to coaches. An integral feature of the model is patient involvement and feedback to support the learning experience.

In independent evaluation of this pilot study showed that it does have benefits in preparing students for clinical practice but that the coaching and peer support reduces the quality and contact of the mentoring role. The clinical educator role was found to be crucial to the success of the model, as was the ratio of students, mentors and patients on any given shift.

What the academic literature shows

There is a broad and varied academic literature about nursing education[114]. As for the other sectors, this literature primarily focuses on specific interventions or approaches rather than taking a broad overview of educational themes and trends, however some systematic reviews on particular educational themes were discovered. The primary themes align with those identified by the regulator and the grey literature:

- There is a strong focus on different approaches to gaining clinical and practical skills whether through outreach and community settings or simulated environments. Public and patient involvement is a key element of this in much of the literature.
- There is a focus on evidence based practice and exploring new ways of introducing it into the curriculum and clinical environments.
- Professionalism and quality assurance are discussed, through a variety of lenses, including possible standardised assessment processes and patient and public involvement.
- Interprofessional working is represented in the literature, although to a lesser extent.

Across the literature, six high quality studies were identified[115], including two randomised control trials and one systematic review relating to simulation as a method for teaching clinical skills. The other high validity studies covered a range of topics. A summary of each of these is included below to provide an overview of the diversity of the academic literature related to initial education of nurses in the UK:

Simulation-based learning in nurse education[116]

[114] Refer also to Appendix 2 for a full classification of the academic literature
[115] The criteria used to identify high quality studies are set out in the Introduction
[116] Cant R & Cooper S, 'Simulation-based learning in nurse education: systematic review' in *Journal of Advanced Nursing* (Volume 66(1), 2010, pp. 3-15)

This paper is a report of a review of the quantitative evidence for medium to high fidelity simulation using manikins in nursing, in comparison to other educational strategies. Twelve studies were included in the review. All reported simulation as a valid teaching/learning strategy. The validity and reliability of the studies varied due to differences in design and assessment methods. The report concludes that simulation may have some advantage over other teaching methods, depending on the context, topic and method and that further exploration is needed to determine the effect of team size on learning and to develop a universal method of outcome measurement.

Effectiveness of clinical simulation in improving clinical performance[117]

This study reports the results of a randomised controlled trial which explored the effectiveness of clinical simulation in improving the clinical performance of recognising and managing an adult deteriorating patient in hospital. The intervention group performed significantly better in the post-objective structured clinical examination and was significantly more satisfied with their teaching method. The study concludes that simulation-based education may be an effective strategy to teach nurses the skills to effectively recognise and manage a deteriorating patient.

The effectiveness of simulation activities on cognitive abilities[118]

This randomised control trial (RCT) was designed to provide evidence on the effectiveness of simulation activities on the clinical decision-making abilities of undergraduate nursing students. Based on previous research, it was hypothesised that the higher the cognitive score, the greater the ability a nursing student would have to make informed valid decisions in their clinical practice. The RCT found no significant difference in cognitive development following two cycles of simulation activities and concluded that more longitudinal studies that quantify the effects of simulation on the cognitive, affective and psychomotor attributes of health science students and professionals are required.

[117] Stayt et al., 'Recognising and managing a deteriorating patient: a randomised controlled trial investigating the effectiveness of clinical simulation in improving clinical performance in undergraduate nursing students' in *Journal of Advanced Nursing* (Volume 71(11), November 2015, pp. 2563-74)
[118] Secomb et al. ,'The effectiveness of simulation activities on the cognitive abilities of undergraduate third-year nursing students: a randomised control trial' in *Journal of Clinical Nursing* (Volume 21(23-24, December 2012, pp.3475-84)

Online or blended learning vs. face-to-face learning of clinical skills[119]

The aim of this systematic review was to determine whether the use of an online or blended learning paradigm has the potential to enhance the teaching of clinical skills in undergraduate nursing. The available evidence suggests that online learning for teaching clinical skills is no less effective than traditional means. This review highlights the lack of available evidence on the implementation of a blended learning approach to teaching clinical skills in undergraduate nurse education.

Service user involvement in pre-registration general nurse education[120]

A systematic review of published studies on service user involvement in undergraduate, preregistration general nursing education (excluding mental health-specific programmes) was conducted examine how students are exposed to engagement with service users. The review reveals that service user involvement commenced later and is more limited in general programmes as compared to equivalent mental health education provision. It found that most of the evaluative evidence focuses on perceptions of the value of involvement. The conclusion of the review is that further research is required to more clearly establish impact on learning and clinical practice.

Critical thinking in nursing education[121]

This systematic review aimed to explore how critical thinking is perceived in previous studies of nursing education, and analyse the obstacles and strategies in teaching and learning critical thinking mentioned in these studies. Seventeen studies were identified that met the inclusion and quality criteria. These studies illustrated that the definition and concept of critical thinking may change from time to time, and hence there is a need to clarify educators' perspective towards critical thinking. It concludes that with a better understanding of critical thinking in nursing education, educators and nursing faculty are able to develop better strategies in enhancing critical thinking development in nursing students, in turn preparing them for future clinical practice.

[119] McCutcheon et al., 'A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education' in *Journal of Advanced Nursing* (Volume 71(2), February 2015, pp.255-70)
[120] Scammell et al., 'Service user involvement in preregistration general nurse education: a systematic review', in *Journal of Clinical Nursing* (Volume 25(1-2), January 2016, pp.53-69)
[121] Chan, Z.C., 'A systematic review of critical thinking in nursing education' in *Nurse Education Today* (Volume 33(3), March 2013, pp.236-40)

Effectiveness of interprofessional education in health professional programme[122]

The objective of this systematic review was to identify the best available evidence for the effectiveness of university-based interprofessional education for health students. The review included all randomised controlled trials and quasi-experimental studies in which two or more undergraduate or post-graduate health professional groups are engaged in interprofessional education. It found that student's attitudes and perceptions towards interprofessional collaboration and clinical decision-making can be potentially enhanced through interprofessional education. However, the evidence for using interprofessional education to teach communication skills and clinical skills is inconclusive and requires further investigation.

5.2.3 Quality assurance of initial education

Accreditation and quality assurance of providers

The NMC currently approves education providers and awards approved education institution (AEI) status before approving their education programmes.

- The NMC's current quality assurance framework[123] for nursing and midwifery education employs a combination of outcome and risk based assessment against AEI requirements.
- It also engages nurses and midwives, employers, students, service users, carers and nursing and midwifery educators (in higher education and practice placement settings) to inform judgements about quality.

This hybrid approach reflects the transitional status of the NMC's current quality assurance framework as it works towards developing outcomes based standards for education. The NMC commissioned KPMG to conduct an independent review of their QA framework, the outline findings of which were presented to NMC Council in September 2017. The NMC is currently developing an implementation plan for the development of new QA standards.

Selection of students

Selection processes for undergraduate degrees include requirements for academic qualifications at GCSE/'A' level or equivalent and an interview.

- The current standards for AEIs include detailed requirements in relation to the selection process, recognition and verification of existing qualifications and specify that a face-to-face interview must be undertaken. They also specify that service users and carers must be involved in some way.

[122] Lapkin et al., 'A systematic review of the effectiveness of interprofessional education in health professional program' in *Nursing Education Today* (Volume 33(2), February 2013, pp. 90-102)
[123] NMC, *Quality Assurance Framework for Nursing and Midwifery* (2013, updated 2017)

- The draft new education framework follows outcomes based principles and so is less detailed and specific in relation to selection processes. However it does include a new, more specific requirement for patients and members of the public to be involved in selection processes.

Assessment of students prior to qualification

Currently the AEIs specify detailed requirements in relation to the assessment of nursing education, under Standard 8: *"Programme outcomes must be tested using valid and reliable assessment methods"*. Pillar 5 of the new draft standards is "Curricula and Assessment" and its overall stated aim is that *"Curricula and assessments are developed, implemented and reviewed to ensure that students achieve the learning outcomes and NMC proficiencies for their approved programme."* Within this there are a number of detailed requirements for assessment, some of which are close to the existing AEIs, but which overall take more of an outcomes-based approach to assessment with particular emphasis on fairness and a new requirement for patients to be involved in the assessment process. There are currently no national assessments following on from qualification prior to registration.

5.2.4 Looking to the future

Although it focuses on England only, *Raising the Bar*[124]provides some insight into future developments in nursing education. It proposes greater focus on general nursing roles, such as community nurses and district nurses, and suggests that in future a holistic nursing education may be more useful than the strict division of the four nursing fields of practice as they currently stand, as there are many more specialisms than this. The report proposes two years general nursing, followed by one year of undergraduate specialism and one year of preceptorship. However there are some challenges to implementing generic education training, not least because it would require a change in the law.

In October 2015 the UK Government announced the establishment of a new care role in England, the 'nursing associate'[125]. The NMC have agreed to regulate the role and in spring 2018 they will consult on draft standards of proficiency for nursing associates.

The issue of mentoring and preceptorship post-qualification is also currently being considered. The Professional Standards Authority (PSA) did not consider it appropriate for educational regulation to apply to preceptorship because this was considered to be an employment issue. An independent evaluation of preceptorship has been undertaken by IFF Research (not in the public domain) which details significant variation in the quality and amount of preceptorship training received by newly qualified nurses. The NMC is considering the findings of this report and any implications for its own activities.

[124] Hill et al., *Collaborative Learning in Practice (CLiP): Evaluation Report* (2016)
[125] https://www.hee.nhs.uk/our-work/developing-our-workforce/nursing/nursing-associate-new-support-role-nursing

5.3 Dentistry

5.3.1 Mechanics of initial education and its regulation

The General Dental Council (GDC) regulates initial education and training in the UK and does this by:

- Setting standards that it expects courses that lead to registration to demonstrate;
- Accrediting courses leading to registration; and
- Undertaking periodic re-accreditation inspections[126].

The Bachelor of Dental Surgery (BDS) is a five-year registrable degree, with those successfully completing a BDS eligible to register with the GDC[127].

Normally, graduates undertake one or two years of Dental Foundation Training following completion of their BDS. This is not compulsory to practise in the UK, however individuals wishing to work in the NHS must have completed the first year of Foundation Training[128].

There are currently 16 institutions accredited to provide BDS courses in the UK[129].

5.3.2 Approach to regulation and requirements of initial education

In 2007, the GDC's Education Committee commissioned a Strategic Review of the GDC's education-related functions[130]. A key conclusion of this review was that the GDC's responsibility should be to define the outcomes required of dental education and training (i.e. the knowledge, skills and attitudes that an applicant for registration must demonstrate in order to join the Register). In practice, this would require a change from the GDC's former focus on detailed prescription of the specific topics and subjects which should feature in dental education and training curricula, and how these should be taught to students and trainees, to an emphasis on the learning outcomes which form the profile of the newly-qualified dentist or DCP. The new approach would also acknowledge that expertise in developing and implementing comprehensive and innovative curricula and training programmes, which will deliver the outcomes the GDC requires, lies with dental education and training providers.

This approach to regulation of initial education and training is now embedded and reflected in its current education standards[131], which are the requirements that education providers must meet in the programmes they offer to enable their students to meet the GDC's registration requirements. These standards cover three areas: patient protection, quality evaluation and review, and student assessment.

[126] https://www.gdc-uk.org/professionals/education and GDC, *Quality Assurance Process BDS* (August 2015)
[127] The Faculty of Dental Surgery, Royal College of Surgeons of England, *Careers in dental surgery* (July 2012)
[128] Ibid
[129] https://www.gdc-uk.org/professionals/education/recent-inspections/inspections-dentistry
[130] As reported in GDC, *The First Five Years* (2008)
[131] GDC, *Standards for Education* (May 2015)

In addition, it has led to the GDC revising the learning outcomes it expects an individual will be able to demonstrate on completion of a suitably assessed education and training programme. These learning outcomes, covering both dentists and dental care professionals (DCPs) in one overarching document, were first produced in 2012 and updated in 2015[132]. They cover the requirements of registrants across four broad outcome domains:

- *Clinical*: the range of skills required to deliver direct care, where registrants interact with patients, and also the essential technical skills, carried out in the absence of patients which support their care, for example, by dental technicians.
- *Communication*: the skills involved in effectively interacting with patients, their representatives, the public and colleagues and recording appropriate information to inform patient care.
- *Professionalism*: the knowledge, skills and attitudes/behaviours required to practise in an ethical and appropriate way, putting patients' needs first and promoting confidence in the dental team.
- *Management and Leadership*: the skills and knowledge required to work effectively as a dental team, manage their own time and resources and contribute to professional practices.

These requirements align with the broad academic consensus on the required skill sets of health professionals. For example, according to the authors of a journal article considering how to design a dental curriculum for the twenty-first century[133]:

> *"Firstly, students need the technical skill and clinical knowledge in order to undertake complex procedures in the mouth. Secondly, they need behaviour management skills in order to empathise, understand and relate to the social context of disease and illness; thirdly, critical path analysis, reasoning and decision making skills. This dimension of their learning provides the ability to synthesise research evidence, patient preferences, their own personal experience and ability in order to plan treatment."*

Peter Butler, Acting QA Operations Manager at the GDC, feels that what is most important from initial education and training is to equip graduates to take a holistic approach to practice where patients are truly the focus. He regards developing skills in professionalism and communication, including resolving complaints, to be a particular priority at an early stage as deficiencies in these areas contribute to many of the Fitness to Practise (FTP) cases that come before the GDC.

The GDC's required learning outcomes also expect that *"all dental professionals must understand the principles of evidence-based practice and be able to make appropriate decisions on patient care using this approach"*.[134]

[132] GDC, *Preparing for Practice – Dental team learning outcomes for registration* (Revised 2015)
[133] McCarg J and Hay E, 'Designing a dental curriculum for the twenty-first century' in *British Dental Journal* (November 2009)
[134] GDC, *Preparing for Practice – Dental team learning outcomes for registration* (Revised 2015)

The GDC also highlights a number of other requirements, such as:

- Preparing students to carry out reflective practice and self-directed learning to keep their knowledge up-to-date throughout their professional lives.
- Ensuring that they understand the importance of team working.
- Providing them opportunity to practise on a sufficient number and wide range of patients.

5.3.3 Content and delivery of initial education

The regulator's perspective

As a regulator, the GDC is currently primarily focused on identifying and improving areas where standards are not being met by education providers and does not focus on capturing examples of good practice. For example, the GDC has found deficiencies, which it is now looking to address, in:

- Ensuring students have access to an adequate number of patients of different ages and backgrounds, with different treatment needs and across different geographies[135].
- Utilising feedback from a variety of sources, including patients and customers[136].
- Encouraging students to engage in reflective practice, to build their ability to reflect on their actions so as to engage in a process of continuous learning[137].

However, there is currently discussion at the GDC about how they could better identify and share good ideas and examples of innovation, acknowledging that what works in a particular setting may not always be transferable. The GDC has provided us some specific examples of what it regards to be good practice from its recent quality assurance work:

Good practice examples identified by the GDC

Liverpool Hygiene and Therapy programme

Practical experience – students attend placements in primary care settings, similar to where they are likely to work upon qualification. This allows for 'real-life' patients and to see the type of work they are likely to encounter.

Peninsula Hygiene and Therapy programme

Practical experience – excellent clinical facilities with a virtual cadaver and simulated learning environments to emulate a professional, clinical setting before progressing to treating patients. Once progressed, students have access to a range of patients across four well-resourced education facilities.

[135] GDC, *Annual review of education 2014-16*
[136] Ibid
[137] Reported by Peter Butler from the GDC

Patient feedback – gathered formally via a survey from at least 100 patients per year across the four education facilities. Data is collated and reviewed to inform the programme.

Reflective practice – reflection is built into the programme via a professional development module which includes the use of questionnaires to reflect on practice before discussing this with tutors during termly meetings. Pieces of written reflection are assessed and students complete reflection after every patient contact.

Sheffield Hygiene and Therapy programme

Practical experience – multiple hospital clinics and wide range of primary care settings so exceptional practical experience in different environments is gained. Students generally exceeded the targets for the numbers of procedures to be completed before final assessment. A regularly compiled Student Patient Situation Report allows the amount of experience and the types of patient required for individual students to be effectively monitored.

Patient feedback – patients contribute to the assessment of students during clinical assessments. Regular patient surveys feed into programme review.

Reflective practice – students reflect on all clinical activity across all clinical settings so have achieved a high level of ability to critically appraise their performance.

UHI Hygiene and Therapy programme

Practical experience – students have access to approximately 80 placements which allows for students to be rotated should they have difficulty treating a particular patient type.

Northampton Dental Nursing programme

Practical experience – well-received outreach placements with experience at oral maxillofacial surgery placements.

What the academic literature shows

The recent academic literature on approaches to initial education and training in UK dentistry demonstrates academic interest in a wide range of pedagogic methods. The most prevalent themes present within the dental literature overall[138] include:

- Methods of student selection or assessment;
- Use of new technology and techniques in teaching; and
- Practical and clinical skill development.

One high quality dental education academic article reflected the 'use of new technology' theme. It specifically measured the effectiveness of the use of an audience response system, which is defined

[138] Refer also to Appendix 2 for a full thematic classification

as *"technology that allows an instructor to present a question or problem to the class; allows student to enter their answers into some kind of device; and instantly aggregates and summarises students' answers for the instructor"*[139]. More detail on this study is provided below:

The effect of using an audience response system on learning, motivation and information retention[140]

A crossover clustered randomised educational trial was used to ascertain the effect of ARS use in undergraduate orthodontic teaching at Leeds Dental Institute. Students at Leeds Dental Institute were taught two different topics within the curriculum to test the use of ARS in a crossover trial. A questionnaire was delivered to the test (ARS) and control (non-ARS) groups. ARS was found to significantly improve student concentration and participation in small group seminar teaching and significantly improved knowledge retention. The authors concluded that ARS may be useful in facilitating orthodontic teaching in the future.

5.3.4 Quality assurance of initial education

Accreditation and quality assurance of providers

In the latest of its regular annual reviews of education[141], the GDC identified that a number of deficiencies among providers in their internal quality assurance procedures which it is now looking at ways of addressing:

- The wide variation in the rigour of arrangements for the quality management of programmes, with many providers only having informal procedures in place.
- That many are not currently presenting a full and coherent mapping of the programme against the GDC's learning outcomes.

There is evidence that its approach to quality assurance of providers is effective[142]. For example, over the past four years, 21% of programmes inspected have required a re-inspection. Following a re-inspection, programmes have demonstrated significant improvement: on average improving in 50% of requirements.

Selection of students

Currently schools have flexibility to implement their own methods of student selection. These vary and, in addition to academic qualifications, may include Situation Judgment Tests (SJT), UK Clinical Aptitude Tests (UKCAT) and Multi-Mini Interviews (MMI).

[139] See, for example, http://www.mimio.com/~/media/Files/Downloads/Partner-Resources/Whitepapers/SRS_Whitepaper.ashx
[140] H Dhaliwal et al., 'The effect of using an audience response system on learning, motivation and information retention in the orthodontic teaching of undergraduate dental students: a cross-over trial' in *Journal of Orthodontics* (June, 2015; 42(2); pp123-35)
[141] GDC, *Annual review of education 2014-16*
[142] Ibid

Assessment of students prior to qualification

As mentioned, The Bachelor of Dental Surgery (BDS) is registrable degree so those successfully completing a BDS are eligible to register with the General Dental Council (GDC).

The GDC's standards for initial education and training include a whole section on assessment and the GDC attends practical examinations as part of its school inspections. While specific methods used for assessment vary from school to school, the GDC has observed a trend in practical assessments away from case presentations (where students present a case from their studies and are asked a series of questions on this by examiners) to the Objective Structured Clinical Examination or OSCE (where students need to progress through a variety of stations, each involving different tasks, with actors playing the part of patients).

There is currently no standard final examination for BDS students and the GDC has no plans to introduce this.

5.3.5 Looking to the future

The GDC is currently exploring more broadly how it can improve regulation of the dental profession, both for patients and registrants, as outlined in its discussion document, *Shifting the balance*[143]. The intention is described as *"moving the focus from resolving problems to prevention".* This is expected to require more focus on quality assurance, including of initial education and training.

In light of this, GDC's is currently reviewing its quality assurance policy for initial education and training. The GDC is planning to consult on its plans in early 2018 with a view to transitioning to the new approach by September 2018. The GDC is proposing to take more of a risk-based approach here, which aligns with the PSA's Right Touch Regulation recommendations[144], and internally is seen as a better way of deciding how to allocate resources. This may mean a variable approach, with low risk schools getting a lighter touch inspections than those where higher risk has been indicated. They may also introduce periodic thematic reviews, e.g. on reflective practice or other areas, across all educational providers.

Another related area of development is looking at ways of making annual monitoring more useful both to providers and to the GDC, such as by involving inspectors in interpreting returns, feeding this data into their risk matrix and providing better feedback to providers.

In addition, the GDC is considering its future approach to updating its learning outcomes. There is a desire within the GDC to ensure that the outcomes remain agile so they are considering developing a process to review them more regularly, perhaps concentrating more on particular aspects of practice to ensure they continue to be relevant given rapid changes in technology and related obsolescence of former methods.

[143] GDC, *Shifting the balance: A better, fairer system of dental regulation* (updated October 2017)
[144] https://www.professionalstandards.org.uk/docs/default-source/publications/thought-paper/right-touch-regulation-2015.pdf

While maintaining a largely outcomes-focused approach to the regulation of education, the GDC envisages that it may become more focused on inputs in selected areas. For example, there may be a need for the GDC to focus more attention on finance and funding issues, especially where this has been identified as a risk to delivery of education programmes. The efficacy of different methods of student selection (as well as assessment) has also been found to be an area of academic interest in dentistry. This suggests that schools may also adapt their approach as the body of evidence evolves.

Finally, as mentioned, the GDC is also looking how they can be more involved as a regulator in identifying and sharing good practice among education providers as a way of helping to drive improvement.

5.4 Pharmacy

5.4.1 Mechanics of initial education and its regulation

The General Pharmaceutical Council (GPhC) is responsible for defining the initial education and training requirements for pharmacists and pharmacy technicians in Great Britain. It does this by:

- Setting standards for the initial education and training:
- Accrediting and recognising courses leading to registration; and
- Co-ordinating the pharmacist pre-registration scheme including the registration assessment.

The initial education/training required to register as a pharmacist with GPhC in Great Britain[145] involves the following stages:

1. Successful completion of a Master of Pharmacy Degree (MPharm), which is normally a full-time, four-year course.
2. Successful completion of one year's pre-registration training, a period of paid employment in one or more practice settings (including community or hospital pharmacies, internet pharmacies, GP practices, mental health trusts and care homes) during which time a trainee is required to build up a portfolio of evidence and demonstrate their competence whilst being observed at work.
3. Passing a standardised pre-registration assessment (examination) which tests specific skills and knowledge as set out in the GPhC's assessment framework[146].

There are currently 31 institutions that provide MPharm courses in Great Britain[147].

5.4.2 Approach to regulation and requirements of initial education

The GPhC takes a largely outcomes-based approach to the regulation of initial education and training and the standards it requires of providers reflect this. Standard 10 from its *Standards required for the initial education and training of pharmacists*[148] explicitly refers to expected outcomes from the initial education and training of pharmacists. The GPhC's required outcomes all describe aspects of ensuring 'safe and effective practice'. The individual outcomes cover both the overall expectations of a pharmacy professional and the skills required in practice; some skills are specific to the pharmacy profession while others are transferable.

[145] The GPhC's remit excludes Northern Ireland
[146] https://www.pharmacyregulation.org/education-and-training-requirements-pharmacy-team
[147] https://www.pharmacyregulation.org/education/pharmacist/accredited-mpharm-degrees
[148] GPhC, *Future pharmacists: Standards required for the initial education and training of pharmacists* (May 2011)

In explaining the GPhC's approach to setting outcomes, Damian Day, Head of Education at the GPhC, refers to the evolution of pharmacy from a vocation with its roots in manufacturing and dispensing to a health profession with a much stronger clinical focus. He says that:

> *"There is now a need to develop patient-centred clinicians with good interpersonal and clinical skills, who are able to work in multi-professional teams and are adaptable to working in varied settings."*

The GPhC's outcomes are consistent with the Quality Assurance Agency's expectations, as set out in its Pharmacy Benchmark Statement, that pharmacy education will enable students to develop a number of critical areas of knowledge, skills and behaviour[149], including:

- An ability to apply scientific knowledge with practical understanding.
- Critical evaluation skills.
- An ability to integrate available information to deal with complex issues.
- An ability to make sound judgments and to take responsibility for decisions.
- An ability to communicate effectively with patients, other professionals and the public.
- Independent learning skills.

However, a more input-related element of the GPhC's regulatory approach is that it requires providers to adopt an integrated approach to their curricula as is outlined in the initial criterion needed to meet Standard 5 from its *Standards required for the initial education and training of pharmacists*[150]. This means schools need to link academic education with practical experience in a coherent way.

> "*The underpinning principle is that the more integration there is between academic learning and practical work, and pharmacy science and practice, the easier it is for students to see relevance."* (Damian Day, Head of Education at the GPhC)

The educational theory supporting the GPhC's position on integrated learning has been derived from medical education, and a number of mainstream medical education textbooks contain relevant evidence[151].

The GPhC's approach in this area also aligns with previous recommendations made for the pharmacy sector specifically:

[149] Quality Assurance Agency for Higher Education, *Subject Benchmark Statement – Pharmacy* (2002)
[150] GPhC, *Future pharmacists: Standards required for the initial education and training of pharmacists* (May 2011)
[151] Mann, Dornan and Teunissen, 'Perspectives on learning' in Dornan, Mann, Scherpbier and Spencer, *Medical Education, Theory and Practice* (2011), pp17-38; Kaufmann and Mann, 'Teaching and learning in medical education: How theory can inform practice' in Swanick, *Understanding Medical Education, Evidence, Theory and Practice*, 2nd edn (2014), pp7-29; and Prideaux, Ash and Cottrell, 'Integrated learning' in Welch (ed.), *Oxford Textbook of Medical Education* (2013), pp63-72

- A report on modernising the pharmacy curriculum in 2009 which advocated the design and delivery of curricula to support learning re-contextualisation of scientific knowledge in practical contexts[152].
- A strategic review of the future pharmacist workforce in 2011 which made the case that separation between undergraduate teaching and work-based learning is a weakness as it results in insufficient exposure to clinical practice during undergraduate education[153].

5.4.3 Content and delivery of initial education

Regulator's perspective

According to the GPhC, the dominant change in initial education has been the building in of more clinical exposure, either directly with patients or in a simulated environment. This has required education providers to make changes in other aspects of the curriculum to accommodate this increase. For example, it has led to a different approach to scientific learning, where 'Knows' and 'Knows How' from Miller's Triangle[154] is increasingly seen as sufficient to demonstrate understanding of scientific aspects of the curriculum. In addition there has been a change in the approach taken to students acquiring knowledge, as the course at its current length cannot cover everything so students are increasingly required to undertake self-directed learning to supplement what they are formally taught.

A related development is that the GPhC's requirement for integration has had a marked impact, leading to curriculum redesign and the inclusion of more reflective learning. This has mainly been within the traditional four-year course structure. However, there are currently a small number of schools[155] offering integrated five-year Pharm courses which include the pre-registration element of pharmacy training.

In the GPhC's experience, increasing interprofessional learning (to help students learn general professional skills and prepare them for working in multi-disciplinary teams) has been the most problematic part of curriculum reform. Change in this area is reportedly happening slowly and from a low base. The GPhC is in currently in consultation with education providers on how to address this.

Finally, there has reportedly been a change in approach to teaching professionalism which now emphasises communications skills and an understanding of diversity as well as the law and ethics.

What the academic literature shows

The most prevalent themes present within the relevant pharmacy literature overall[156] include:

[152] Institute of Education, University of London, *Modernising the Pharmacy Curriculum* (2009)
[153] Centre for Workforce Intelligence, *A Strategic Review of the Future Pharmacist Workforce* (2013)
[154] https://www.pharmacyregulation.org/content/millers-triangle
[155] University of Bradford, University of Nottingham, University of East Anglia
[156] Refer also to Appendix 2 for a full thematic classification

- Practical and clinical skill development; and
- Interprofessional education.

Only two of the education academic articles we identified describe high validity studies. Both relate to aspects of interprofessional education and the findings of these studies are summarised below:

Interprofessional ethics and professionalism debates: findings from a study involving physiotherapy and pharmacy students[157]

An interprofessional education (IPE) debate in ethics and professionalism was developed for first year undergraduate pharmacy and physiotherapy students. A controlled 'before-and-after' study was conducted. The opinion of students on IPE, the debate topics and debating was determined before and after the debate. Findings showed that students agreed that debating ethics through IPE was a valid teaching modality. They found the debates challenging and they stimulated critical thinking and interest in complex and controversial issues. Students also found it of benefit to work as a team. The authors concluded that in-class debate is a useful way of learning together.

Supervised pharmacy student-led medication review in primary care for patients with type 2 diabetes[158]

Third year pharmacy students were recruited from one UK School of Pharmacy and trained to provide face-to-face consultations to patients with type 2 diabetes, and review their medical records, under supervision while situated within the patient's medical practice. Patients were also recruited to take part. Initial data analysis from a randomised control trial showed potential for impact in the right direction for some outcomes measured including glycated haemoglobin, quality of life and patient satisfaction with information about medicines. The intervention was also found to be feasible and acceptable to patients. The study concluded that student and patient recruitment are possible. The intervention was well received and demonstrated some potential benefits. While the intervention was relatively inexpensive and provided an experiential learning opportunity for pharmacy students, its cost-effectiveness remains to be determined.

5.4.4 Quality assurance of initial education

Accreditation and quality assurance of providers

[157] Strawbridge et al.,'Interprofessional ethics and professionalism debates: findings from a study involving physiotherapy and pharmacy students' in *Journal of Interprofessional Care* (Volume 28(1), January 2014)
[158] Adams et al., 'Supervised pharmacy student-led medication review in primary care for patients with type 2 diabetes: a randomised controlled pilot study' in *BMJ* (Volume 5, Issue 11, 2012)

The GPhC's role in quality assurance includes accrediting and recognising courses leading to registration. The reaccreditation process for existing MPharm degrees currently requires a full reaccreditation visit every six years, with an interim visit every three years.

The GPhC involves lay people and recent registrants who have just consumed education/training as part of their accreditation teams to provide a holistic perspective.

The GPhC's learning outcomes-based approach to regulation means that this is the focus of its inspections rather than the more traditional aspects such as staffing, teaching and resources (although these are still covered). The GPhC involves all staff in these discussions in order to encourage staff to design courses and modules collaboratively. In the GPhC's experience, this helps to prevent silo working, as has been the case historically when pharmacy practice and science elements of the course have been delivered separately.

Selection of students

Currently pharmacy schools have flexibility to implement their own methods of student selection. These vary and, in addition to academic qualifications, may include a written personal statement, online tests and selection days involving written and practical tests and interviews. These methods are designed to test the ability of students to meet the school's values and to demonstrate the students' personal qualities.

Assessment of students prior to qualification

As mentioned, at the end of the pre-registration training period the GPhC requires all students to sit a registration assessment examination. This is to provide a consistent method for assessing competency prior to admission to the register.

5.4.5 Looking to the future

The GPhC is planning to update its standards for initial education and training of pharmacist students. Prior to commencing this re-drafting the GPhC issued a discussion document on the direction of travel for pharmacy education and training[159]. This sets out what the GPhC's believes to be broadly agreed priorities for healthcare delivery generally as well as its views on the role of pharmacy and how initial education and training standards may need to adapt to equip pharmacists (and pharmacy technicians) to deliver the care described. In particular, the GPhC believes that the experience provided of patient-centred care and interprofessional learning needs to be increase, and integrated education continues to be a priority. There was reportedly strong agreement among stakeholders with this vision so the re-drafing of its standards can be expected to reflect this. Another change that the GPhC expects is more direction on the student selection process and how to ensure prospective students demonstrate the professional qualities required. A pre-consultation phase on the new standards is now underway and a full consultation is planned for upcoming months.

[159] GPhC, *Tomorrow's Pharmacy Team* (June 2015)

In terms of its approach to quality assuring education providers, the GPhC has no plans to move away from periodic reaccreditation. However, the GPhC may make changes to its approach to inspections, including reducing the team size and moving to smaller group discussions rather than large meetings, in order to reduce the burden on staff involved. In addition, earlier this year, the GPhC ran a series of focus groups with MPharm students and the feedback from them was that they wanted input in to course design and also greater input in to re-accreditation. The GPhC believes both points are valid and will work them in to proposals for a revised accreditation methodology. The GPhC is also considering how best to take account of patient views in re-accreditation.

Apart from regulatory changes, there may be changes to how pre-registration training is delivered, including:

- Providing exposure to different types of practice environment and introducing multi-professional reviews rather than just reliance on individual tutor assessments[160].
- Introducing of new systems to record and share evidence during pre-registration training and well as to enhanced the wider support available to students[161].

Looking longer-term, the GPhC expects some changes in undergraduate education as well. One of these is a trend towards more institutions providing integrated five-year Pharm courses[162], aligning with the recommendations from *Modernising Pharmacy Careers*[163] and *Strategic Review of the Future Pharmacist Workforce*[164]. However, government funding is currently an impediment to this as MPharm is treated as a scientific rather than clinical degree.

In addition, there is reportedly some debate within the sector currently about whether initial education and training should enable graduates to be qualified independent prescribers (IP). He expects that there will be more content relevant to prescribing incorporated into initial education but that full IP will remain a post-graduate qualification (and annotation on the register) because it will not be possible to provide the level of patient experience required to be competent within an undergraduate degree. Another consideration is minimising the risk of qualifications going unused in practice.

[160] Reported by Damian Day from the GPhC
[161] https://hee.nhs.uk/our-work/developing-our-workforce/pharmacy-education-training/training-pre-registration-pharmacists
[162] Currently this type of course is only offered in 3 universities – University of Bradford, University of East Anglia and University of Nottingham
[163] Medical Education England, *Modernising Pharmacy Careers Programme* (2011)
[164] Centre for Workforce Intelligence, *A Strategic Review of the Future Pharmacist Workforce* (2013)

6. Conclusions

This conclusion section answers the research questions that were set for this review, drawing on all evidence sources and all of the jurisdictions covered.

6.1 What educational concepts, theories and methods currently inform the professional regulatory standards of health professional education?

Regulators and accreditation bodies in all of the jurisdictions covered have in common that they take a largely outcomes-based approach to their intervention in initial education. The standards set for providers therefore relate to expected learning outcomes and development of competencies which are adapted to reflect changes in practice and associated professional skills required. Standards for initial education provision tend not to prescribe specific content or methods, so they do not appear to be particularly influenced by particular educational concepts or theories. The specific intention of this approach is to allow providers the flexibility to design their own programmes drawing on their pedagogic expertise, and to innovate as appropriate, subject to a demonstration that the outcomes are being met.

6.2 Are there any thematic domains that are common to the education standards in multiple jurisdictions?

There is considerable variation in how standards have been drafted between jurisdictions. However, some commonalities across multiple jurisdictions include:

- An explicit articulation of the priority placed on protecting patient and public safety.
- An emphasis also on the student experience and supporting learners.
- A close tie-in to learning outcomes.
- Coverage of key aspects of education delivery including curriculum, assessment and governance, but with a focus on demonstrating outcomes rather than prescribing methods.

6.3 What evidence is there of national or regional qualifying/licensure examinations?

There are currently standardised licensure examinations in place in the following jurisdictions – US and Canadian optometry, Canadian opticianry and UK pharmacy. In addition, the GMC is planning to introduce standardised examinations in UK medicine. This approach is seen as a way of ensuring consistency of graduate standards by the jurisdictions using or planning this approach. However, other regulators are not currently considering this because they believe their standards on assessment to be sufficient. The regulator in South Africa has looked into this method but has concluded that the resources required to implement it would be too great for it to be feasible there.

6.4 How are health professional education programmes are accredited and quality assured?

The approach taken to accreditation and quality assurance is broadly consistent across the various jurisdictions. Initial approval of a provider is based on a detailed assessment to ensure it is meeting the required standards. There is then regular monitoring, via feedback forms and other evidence collection, and periodic re-accreditation.

The GMC in the UK already applies a risk-based approach to accreditation and some other regulators (e.g. OCANZ in Australia and the GDC and in the UK) reported that they are considering moving to this. This would mean a differentiated approach to, and frequency of, quality assurance, monitoring and re-accreditation based on a determination of risk levels.

6.5 What does the evidence indicate about the future direction of travel in professional regulation, standards and delivery of education?

A number of regulators are looking to update their standards (for example, the NMC has new education standards currently in development, the GMC is looking to update its outcomes for graduates and the GDC is planning to update its learning outcomes). There was general discussion in the interviews of the need for standards to remain agile in response to changes in the practice environment. It is also anticipated that there will be a continuation of the trend towards collaboration between relevant bodies in the development of standards and an effort to ensure harmonisation, particularly with respect to transferable professional skills. As previously mentioned, a number of regulators reported that they are moving to a risk-based/differentiated approach to accreditation and quality assurance.

On the education delivery side, a continued focus can be expected on the current priority areas, which include:

- Developing students' critical appraisal skills and the ability to undertake reflective learning and evidence based practice.
- Providing students with sufficient and varied opportunities to gain practical and clinical experience.
- Considering ways in which students can undertake interprofessional learning.
- Enabling students to learn and demonstrate the general qualities required of health professionals, including communication skills and an understanding of patient diversity.

Beyond this, there is a general expectation that initial education programmes will need to keep adapting in response to further changes in scopes of practice and associated developments in required standards.

Specifically, it is envisaged that there will be more focus on encouraging students to take more responsibility over their own learning and development. In addition, developing leadership skills has been identified as a common challenge for the health professions. Those who participated in this review anticipated that addressing this would be a new focus for all those involved in initial education.

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Nursing:

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Dentistry:

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Pharmacy:

https://www.pharmacyregulation.org

Appendix

A1 Detailed methodology

The evidence in this research was collected via a Rapid Evidence Assessment (REA) of available academic and grey literature, supplemented by a series of in-depth interviews with selected experts across the different jurisdictions.

A1.1 Rapid Evidence Assessment (REA)

A Rapid Evidence Assessment (REA) is a systematic method of identifying and assessing available literature, but it is less time-intensive than a full systematic review. It is defined by the UK Civil Service[165] as:

> *"A quick overview of existing research on a (constrained) topic and a synthesis of the evidence provided by these studies to answer the REA question. REAs provide a balanced assessment of what is already known about a policy or practice issue, by using systematic review methods to search and critically appraise existing research. They aim to be rigorous and explicit in method and thus systematic but make concessions to the breadth or depth of the process by limiting particular aspects of the systematic review process."*

A systematic search was undertaken via a number of search engines and databases, as well as selected specific sources:

- Google;
- Google Scholar;
- PubMed;
- Cochrane database of systematic reviews;
- The Journal of Optical Education (which was not indexed on the above databases);
- Websites of all relevant regulators and/or accreditation bodies in each jurisdiction; and
- Relevant sources footnoted in previously identified literature.

An extensive variety of terms were initially used for the search engine and database searches:

- Approaches to/methods of [insert health sector/market] initial education;
- Educational theory of/learning styles/learning outcomes/educational competencies…;
- Good practice in/issues in…;
- Trends in/developments in/innovations in/future of…;

[165] http://webarchive.nationalarchives.gov.uk/20140402163359/http://www.civilservice.gov.uk/networks/gsr/resources-and-guidance/rapid-evidence-assessment/what-is

- Design of/content of/delivery of…;
- Standard setting in/accreditation of/governance of/quality assurance of/regulation of…; and
- Reviews of/evaluations of….

However, these search terms were found to be too specific to be fruitful in searching for academic literature and we detected bias in the sources uncovered using this method (e.g. a focus on only one specific approach to health education or area of clinical interest). We therefore adopted a more generalised search terms to identify the academic literature: 'undergraduate/initial education' + health profession + jurisdiction.

Literature was then excluded if it:

- Was not specifically concerned with the content or delivery of initial education;
- Had no focus on the health profession or jurisdiction of interest;
- Was produced before 2010[166];
- Was purely presenting the opinion of the author/s; and
- Focused on approaches with relevance only to very specific clinical settings.

As we were not addressing a constrained research topic, the body of academic literature we identified was vast and also very diverse. In total, we identified 191 academic literature sources that were in scope and warranted further review, and we estimate that we screened more than 500 academic sources for relevance. In addition, we reviewed approximately 90 sources from the grey literature.

Individually there were very few academic articles that were found to be directly relevant to the research questions as most reported on one specific pedagogic method, often in a single setting, rather than on wider patterns and trends. We therefore found most value in using the academic material to:

- Identify broader themes across the body of academic literature overall; and
- Highlight examples of good practice from high validity literature where this exists.

We used a grounded analytical approach to assess the topics of focus in each individual article. We reviewed the abstracts where the article was behind a pay wall, and the whole article where it was published on an open access platform. We began by assessing material in each geography or health profession separately, and then conducted a comparative analysis to identify overall patterns and trends. This analysis can be found in Appendix 2. Academic material is also not an indication of current prevalence in practice or trends in adoption, which would require the undertaking of an audit of providers.

[166] We had to expand this criterion slightly in the case of South Africa because of the dearth of available literature

As shorthand to understand the quality of the academic evidence about educational interventions or approaches, we used the GRADE approach that is recommended by the Cochrane[167] and utilises the following categories:

- High – e.g. appropriately powered Randomised Control Trials (RCTs), systematic reviews
- Moderate – e.g. underpowered or possibly biased RCTs.
- Low – all non-RCTs start at this level.
- Very low – non-RCTs with additional factors that introduce bias or questionable results.

Almost all of the academic literature we found in relation to initial education in the jurisdictions of interest was low or very low in terms of research quality. Those studies that were high or moderate quality tended to focus on one specific approach or intervention rather than patterns and trends.

In addition, there were some gaps in the literature:

- There is little available academic or grey literature focused on South Africa, and we needed to look further back than 2010 in order to find relevant material.
- There is also a general paucity of research related to initial education in dispensing optics. This may be because the function is not regulated in all the countries examined and also due to delivery of dispensing optics education being largely vocationally based.

A1.2 Expert interviews

We engaged with a total of 16 experts, 15 of whom we interviewed in detail, across the 9 jurisdictions of interest. The interviews were with representatives from regulators and accreditation bodies, as well as education providers. A full list of the participants is contained in Appendix 3.

The GOC nominated the representatives from the UK-based regulators of other health professions that it wished to be approached. Collaborate Research identified relevant representatives from optics regulators and/or accrediting organisations in the USA, Canada, Australia, New Zealand and South Africa. In addition, the GOC's Expert Advisory Group for the Education Strategic Review provided suggestions of academics in Australia, New Zealand, USA and Canada who would be appropriate to include in this review. The academics were nominated based on having previous UK-based experience and knowledge of how their own setting compares with the UK with respect to initial optics education and its regulation.

All contacts in the initial long-list of prospective interviewees were emailed an invitation to participate which also included an introductory letter from the GOC explaining the research. In some cases the initial contact recommended an alternative contact or delegated the interview to another member of staff.

[167] http://cccrg.cochrane.org/sites/cccrg.cochrane.org/files/public/uploads/how_to_grade_revising_1_december_2016.pdf

The interviews lasted an average of 45 minutes and took place by telephone or Skype between 16 October and 2 November, 2017. We also engaged in email correspondence with some experts to follow up on points made or fact-check.

We have triangulated the evidence collected in the interviews with the published literature in order to fact-check and ensure the validity of the findings reported. In addition, all interviewees have been promised the opportunity to review the relevant chapters of the report and correct any factual inaccuracies or misrepresentations prior to the publication of this report.

In some cases interviewees were reluctant to comment on areas they felt were outside the scope of their organisations. For example, a number of regulators were not able to identify patterns and trends in education content and delivery, or examples of good practice. In addition, in some jurisdictions standard-setting and accreditation responsibilities for initial education are shared by a number of bodies, including professional associations and education boards as well as regulators and accreditation bodies. Due to the limited interview programme it was not possible for us to represent the perspective of all organisations involved.

A3 Full thematic analysis of the academic literature

The approach taken to identifying and assessing the academic literature is described in Appendix 1.

This overview table below provides a brief summary of the 6 main themes that were developed, using grounded thematic analysis, drawing on the 191 recent academic articles on initial education and training identified across the jurisdictions of interest. The detailed tables that follow provide reference to the high quality research found for each jurisdiction and each theme.

Overall, across the 9 jurisdictions:

Topic	*Number of articles found*	*High quality studies found*
New technology and techniques in teaching	52	3
Practical and clinical skill development	50	6
Interprofessional education	29	3
Methods of student selection or assessment	26	
Critical appraisal skills/evidence-based practice	23	1
Professionalism	21	

Optics in Australia and New Zealand:

Number of articles in scope: 15 (no high quality studies found)

Topic	*Number of articles found*	*High quality studies found*
New technology and techniques in teaching	5	
Critical appraisal skills/evidence-based practice	4	
Practical and clinical skills development	3	
Methods of student selection or assessment	3	
Professionalism	2	
Interprofessional education	2	
Other	3	

Optics in USA and Canada:

Number of articles in scope: 44 (1 high quality study)

Topic	*Number of articles found*	*High quality studies found*
New technology and techniques in teaching	19	
Interprofessional education	12	Reeves et al. (2013)[168] found a lack of strong evidence for the effectiveness of IPE
Critical appraisal skills/evidence-based practice	7	
Practical and clinical skills development	4	
Methods of student selection or assessment	1	
Professionalism	1	
Other	1	

Optics in South Africa

Number of articles in scope: 5, but over a longer time frame (no high quality studies found)

Topic	*Number of articles found*	*High quality studies found*
Other	4	
Practical and clinical skills development	1	
New technology and techniques in teaching	0	
Critical appraisal skills/evidence-based practice	0	
Methods of student selection or assessment	0	
Professionalism	0	
Interprofessional education	0	

[168]Reeves et al. "The effectiveness of interprofessional education: key findings from a new systematic review." *Journal of Interprofessional* Care (2010 May;Volume 24)

UK Medicine:

Number of articles in scope: 35 (2 high quality studies found)

Topic	*Number of articles found*	*High quality studies found*
Practical and clinical skill development	13	Janjua et al, (2017)[169] - found that using gynaecology teaching associates (PPI supported examinations) rather than manikins improved objectively assessed competence in pelvic examination
Professionalism	8	
New technology and techniques in teaching	7	Alnabelsi et al. (2015)[170] found no difference between outcomes in F2F vs. e-learning
Methods of student selection or assessment	4	
Critical appraisal skills/evidence-based practice	3	
Interprofessional education	2	

UK Nursing and midwifery:

Number of articles in scope: 46 (6 high quality studies found)

Topic	*Number of articles found*	*High quality studies found*
Practical and clinical skill development	14	Cant R.P. & Cooper (2010)[171] concludes that simulation may have some advantage over other teaching methods, depending on the context, topic and method and that further exploration is needed to determine the effect of team size on

[169] Janjua et al. "The effectiveness of gynaecology teaching associates in teaching pelvic examination to medical students: a randomised controlled trial" *European Journal of Obstetrics & Gynaecology and Reproductive Biology*, (March 2017 Volume 210)
[170] Alnabelsi et al. "Comparison of traditional face-to-face teaching with synchronous e-learning in otolaryngology emergencies teaching to medical undergraduates: a randomised controlled trial." *European Archives of Oto-rhino-laryngology.* (2015 Mar; Volume 272)
[171] Cant R.P. & Cooper S.J 'Simulation-based learning in nurse education: systematic review', *Journal of Advanced Nursing* (2010, Volume 66)

		learning and to develop a universal method of outcome measurement. Stayt et al. (2015)[172] reports the results of a randomized controlled trial which explored the effectiveness of clinical simulation in improving the clinical performance of recognizing and managing an adult deteriorating patient in hospital. The study concludes that simulation-based education may be an effective strategy to teach nurses the skills to effectively recognize and manage a deteriorating patient. Secomb et al. (2012)[173] found no significant difference in cognitive development following two cycles of simulation activities and concluded that more longitudinal studies that quantify the effects of simulation on the cognitive, affective and psychomotor attributes of health science students and professionals are required. Scammell et al (2016)[174] conducted a systematic review of published studies on service user involvement in undergraduate, preregistration general nursing education (excluding mental health-specific programmes). The review reveals that service user involvement commenced later and is more limited in general programmes as compared to equivalent mental health education provision. Most of the evidence focuses on perceptions of the value of involvement. Further research is required to more clearly establish impact on learning and clinical practice.
New technology and use of new techniques in teaching	12	McCutcheon et al. (2015)[175] conducted a systematic review to determine whether the use of an online or blended learning paradigm has the potential to enhance the teaching of clinical skills in undergraduate nursing. The available evidence

[172] Stayt et al. 'Recognizing and managing a deteriorating patient: a randomized controlled trial investigating the effectiveness of clinical simulation in improving clinical performance in undergraduate nursing students', *Journal of Advanced Nursing* (November 2015 Volume 71)
[173] Secomb et al. "The effectiveness of simulation activities on the cognitive abilities of undergraduate third-year nursing students: a randomised control trial" *Journal of Clinical Nursing* (December 2012 Volume 21)
[174] Scammell et al. 'Service user involvement in preregistration general nurse education: a systematic review', *Journal of Clinical Nursing* (January 2016 Volume 25)
[175] McCutcheon et al. 'A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education', *Journal of Advanced Nursing* (Feb 2015 Volume 71)

		suggests that online learning for teaching clinical skills is no less effective than traditional means. The review highlighted the lack of available evidence on the implementation of a blended learning approach to teaching clinical skills in undergraduate nurse education.
Methods of student selection and assessment	8	
Critical appraisal skills/evidence-based practice	7	Chan (2013)[176] conducted a systematic review to explore how critical thinking is perceived in previous studies of nursing education, and analyse the obstacles and strategies in teaching and learning critical thinking mentioned in these studies. It concludes that with a better understanding of critical thinking in nursing education, educators and nursing faculty are able to develop better strategies in enhancing critical thinking development in nursing students, in turn preparing them for future clinical practice.
Interprofessional Education	5	Lapkin et al (2013)[177] concluded that the evidence for using interprofessional education to teach communication skills and clinical skills is inconclusive and requires further investigation.
Professionalism	5	

UK Dentistry:

Number of articles in scope: 24 (1 high quality study found)

Topic	***Number of articles found***	***High quality studies found***
Methods of student selection or assessment	8	

[176] Chan, Z.C "A systematic review of critical thinking in nursing education", *Nurse Education Today*. (March 2013 Volume 33)
[177] Lapkin et al. 'A systematic review of the effectiveness of interprofessional education in health professional program', *Nursing Education Today* (2013 Feb; Volume 33)

New technology and techniques in teaching	6	Dhaliwal et al. (2015)[178] found evidence of effectiveness of using an audience response system on the learning, motivation and information retention in the orthodontic teaching of undergraduate dental students
Practical and clinical skill development	4	
Professionalism	3	
Interprofessional education	2	
Critical appraisal skills/evidence-based practice	1	

UK Pharmacy:

Number of articles in scope: 22 (2 high quality studies found)

Topic	***Number of articles found***	***High quality studies found***
Practical and clinical skill development	8	Adams et al, (2015)[179] found that it is possible for student pharmacists to review diabetes medication and a valuable community learning experience.
Interprofessional education	6	Strawbridge et al, (2014)[180] found that ethics is a core component of healthcare curricula and may provide ideal content for interprofessional education (IPE).
New technology and techniques in teaching	3	
Professionalism	2	

[178] Dhaliwal et al "The effect of using an audience response system on learning, motivation and information retention in the orthodontic teaching of undergraduate dental students: a cross-over trial." (2015 June, Volume 42)
[179] Adams et al. "Supervised pharmacy student-led medication review in primary care for patients with type 2 diabetes: a randomised controlled pilot study." *BMJ Open* (2015; Volume 5)
[180] Strawbridge et al "Interprofessional ethics and professionalism debates: findings from a study involving physiotherapy and pharmacy students". *Journal of Interprofessional Care* (2014 Jan; Volume 28)

Methods of student selection or assessment	2	
Critical appraisal skills/evidence-based practice	1	

A2 Expert interview list

UK-based non-optical health professional undergraduate education	
Medical	Mark Dexter, Head of Education Policy, General Medical Council
Nursing/ Midwifery	Anne Trotter, Assistant Director, Education and Standards, Nursing and Midwifery Council
Dental	Peter Butler, QA Operations Manager, General Dental Council
Pharmacy	Damian Day, Head of Education, General Pharmaceutical Council

Non-UK undergraduate optical education	
Australia	Sian Lewis, Executive Officer, Optometry Council of Australia and NZ (OCANZ) Susan Kelly, Accreditation Manger, Optometry Council of Australia and NZ (OCANZ)
	Professor Harrison Weisinger, Global Professional Services Director at Specsavers Group and formerly Foundation Director of Optometry Studies, Deakin University
	Professor Craig Woods, Head Of Clinical Partnerships – Optometry, Deakin University
	Professor Fiona Stapleton, Head of School of Optometry and Vision Science, University of New South Wales
New Zealand	Lindsey Pine, Registrar Optometrists and Dispensing Opticians Board (ODOB) – *not interviewed but provided information by email* Dr Nicola Anstice, Professional Standards Advisor at the Optometrists and Dispensing Opticians Board and Senior Lecturer in the Department of Optometry & Vision Science, University of Auckland
USA	Joyce Urbeck, Director, Accreditation Council on Optometric Education
	Professor Mark Bullimore, Dean at Southern California College of Optometry
Canada	Professor Lyndon Jones, Director at the Centre for Contact Lens Research, University of Waterloo
South Africa	Pat Von Poser, Professional Board for Optometry and Dispensing Opticians Vice-Chair and Head of Department for Optometry at the University of Johannesburg Anthea Pinto-Prins, Professional Board for Optometry and Dispensing Opticians member and Lecturer at the Department for Ophthalmic Sciences, Cape Peninsula University of Technology