

## Advanced musculoskeletal physiotherapy practice

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DOI:

[10.1016/j.msksp.2020.102174](https://doi.org/10.1016/j.msksp.2020.102174)

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*Document Version*

Publisher's PDF, also known as Version of record

*Citation for published version (Harvard):*

Fennelly, O, Desmeubles, F, OSullivan, C, Heneghan, N & Cunningham, C 2020, 'Advanced musculoskeletal physiotherapy practice: informing education curricula', *Musculoskeletal Science and Practice*, vol. 48, 102174. <https://doi.org/10.1016/j.msksp.2020.102174>

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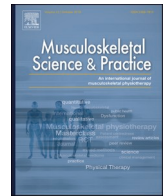
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## Review article

## Advanced musculoskeletal physiotherapy practice: Informing education curricula

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## ARTICLE INFO

## Keywords:

Physical therapy speciality  
Education  
Musculoskeletal diseases  
Clinical competence  
Competency-based education  
Advanced practice

## ABSTRACT

**Introduction:** Physiotherapists are operating at an advanced level of practice, usually on *ad hoc* basis with inhouse training, in response to the increasing burden of musculoskeletal (MSK) disorders. Discrepancies in role-specific education of advanced practice physiotherapists (APPs) creates challenges in ensuring a quality service, workforce mobility and formal recognition. This study reviewed existing MSK APP competency frameworks and education offerings, and explored physiotherapist learning needs with a view to informing international standardisation of MSK APP education curricula.

**Methods:** A scoping review of the literature and relevant university and regulatory websites identified APP competency frameworks and education curricula, which were verified by international experts. Content analysis, performed on the identified competencies and modules, produced a list of themes existing in MSK advanced practice internationally. A survey based on those themes identified the learning priorities of physiotherapists (n = 25) participating in an APP symposium in Ireland.

**Results:** Six APP competency frameworks and eleven curricula from the UK, Canada and Australia were identified. Themes emerging, regarding MSK APP practice internationally, included both entry-level physiotherapy (e.g., *Assessment and Diagnosis*) and traditionally medically-controlled tasks (e.g., *Injection Therapy*), as well as *Research, Leadership, Service Development, Professional-related Matters* and *Education*. Participating physiotherapists more commonly prioritised competencies which would be deemed beyond entry level physiotherapy skills (i.e., *Radiology* versus *Manual Therapy*).

**Conclusion:** Despite variances in profiles of APPs both between and within countries, common themes emerged regarding their expected competencies and skills. This study provides the foundation for the adoption of internationally-recognised MSK APP competencies and education standards.

## 1. Introduction

The impact of musculoskeletal (MSK) disorders includes poor health related quality of life, increased healthcare utilisation (van der Zee-Neuen et al., 2016), sickness absence from work and loss of productivity (Bevan et al., 2009; EUMUSC.net, 2007). Physiotherapy roles and education pathways are evolving to ensure that physiotherapists have the right mix of skills and competencies in order to respond to the growing MSK burden and address patient needs (WHO, 2013; World Confederation of Physical Therapists, 2019; King et al., 2017). These

enhanced roles often require physiotherapists to operate at an advanced level of practice rather than in a specific role (McNeill and Poole, 2014; Chartered Society of Physiotherapists, 2016), and perform traditionally medically-controlled tasks e.g., triaging patient care, prescribing medications, ordering imaging and administering injections (McPherson et al., 2006). Advanced practice physiotherapists (APPs) often manage the care of patients who are deemed not to require medical or surgical interventions (Fennelly et al., 2018a; Wood et al., 2016), with the aim of reducing wait times and providing more appropriate care for these patients (Fennelly et al., 2018a; Razmjou et al., 2013; Daker-White et al.,

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<https://doi.org/10.1016/j.msksp.2020.102174>

Received 14 January 2020; Received in revised form 15 April 2020; Accepted 22 April 2020

Available online 30 April 2020

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1999; Sephton et al., 2010).

Advanced practice physiotherapy services have emerged in countries including the United Kingdom (UK), Australia, Canada and Ireland (Fennelly et al., 2017), and commonly within MSK services across orthopaedics, rheumatology, emergency departments and primary care (Fennelly et al., 2017; Desmeules et al., 2012), but also in neurology, cardiorespiratory and women's health services (Lockstone et al., 2019; Brismee et al., 2018; Saxon et al., 2014; Brennen et al., 2019). These APP services have usually been developed on an *ad hoc* basis, allowing them to be adapted to the specific needs of the local service with provision of inhouse training (Welsh Government, 2011; Stevenson et al., 2020). This was the case in Ireland where initially clinical specialist physiotherapists began working at an advanced practice level in low back pain and fracture clinics at individual hospitals (Curley et al., 2004; Moloney et al., 2009). Since 2011, a national *MSK Physiotherapy Triage Initiative* has established 24 APP positions across orthopaedic and rheumatology services in 18 acute hospitals (Fennelly et al., 2018a). However, lack of national credentialing, clearly defined scope of practice of APPs and standardised training, both in Ireland and internationally, presents service challenges and professional issues (Skinner et al., 2015). These include inconsistent job titles and descriptions (Froment et al., 2019), blurring of professional boundaries (Tawiah et al., 2018; Lahey and Currie, 2005), lack of professional recognition, remuneration and governance (Distler, 2007; Broome, 2015), and difficulty demonstrating the transferability of skills and generalisation of the overall benefits of such models of care (Welsh Government, 2011; Holdsworth et al., 2008; Moffatt et al., 2017; O Sullivan and Doody, 2014). Additionally, inhouse training alone can lack the rigour and resources required to ensure standardised certification (Skinner et al., 2015).

A masters or doctorate level of education and more than five years of specific MSK experience is required by APPs in the UK and Australia (Chartered Society of Physiotherapists, 2016; Australian Physiotherapy Association (APA), 2009), and most APPs in Ireland also meet these criteria (Fennelly et al., 2018b). However, discrepancies exist between the post-graduate education and continuous professional development (CPD) on offer and completed (Stanhope et al., 2012). This leads to variability in practice and potential gaps in knowledge (Fennelly et al., 2018b), which could potentially affect patient outcomes (Skinner et al., 2015). The World Confederation of Physical Therapy (WCPT) (World Confederation of Physical Therapists, 2019) and APPs themselves (Fennelly et al., 2018b; Morris et al., 2014; Dawson and Ghazi, 2004) have therefore advocated for a clear definition of APP professional competencies and standardised education. Additionally, an apprenticeship model for advanced practitioners to help standardise education is currently under development in the UK (Chartered Society of Physiotherapists, 2017). Adoption of standardised MSK APP competencies internationally would promote consistent use and recognition of the advanced practice title, and enable physiotherapists to demonstrate capability to competently and safely undertake tasks at an advanced practice level (Lahey and Currie, 2005; Crane and Delany, 2013).

To design competency-based education, which is increasingly being used in the education of advanced practitioners (Skinner et al., 2015; Broome, 2015; Bergstrom and Lindh, 2018), Parson et al. (2018) recommended the following steps: (1) identification of the required APP competencies, (2) organisation of competencies into themes, (3) organisation of themes into courses, and (4) organisation of courses into curricula. Stakeholder input is also needed to review the clinical priorities, learning needs of clinicians, and the overall health system within which the service is to be situated (Harding et al., 2015; Lee et al., 2013). As APPs have existed in MSK services for over 30 years (Byles and RSM, 1989), a variety of competency frameworks and education curricula have likely been adopted internationally. Therefore, this study aimed to review the existing international APP competency frameworks and education curricula, and explore physiotherapist learning needs in a local context, with a view to informing the development and enhancement of MSK APP education curricula.

## 2. Methods

### 2.1. Study design

A scoping review was performed based on the framework proposed by Arksey and O'Malley (2005) (Arksey and O'Malley, 2005), with reporting guided by the PRISMA-SCR checklist (Tricco et al., 2018). These data were triangulated with a cross-sectional survey of physiotherapists in Ireland.

### 2.2. Ethics

The Human Research Ethics Committee at University College Dublin approved conduct of this study.

### 2.3. Data collection

To identify existing competency frameworks, education programmes and learning priorities for physiotherapists, data were collected and triangulated from several sources (Fig. 1). This method was based on previous research which aimed to identify education needs for health professionals (Gardner et al., 2006; Niles and Hunt, 2018).

#### 2.3.1. Identification of APP competencies and curricula

A search of PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases was conducted using key words and subject headings related to "Physiotherapy", "Advanced Practice" and "Education" or "Competency" [Appendix], initially in 2018 and repeated in January 2020. The identified articles ( $n = 180$ ) were screened by title and abstract, with the full text articles of potentially relevant papers accessed to identify whether an APP competency framework or education curriculum, which met the established inclusion criteria (Table 1), was reported. Reference lists of the relevant articles ( $n = 8$ ) were also searched for any additional studies and to identify the source of the education curricula or competency framework. As the researchers recognised that not all APP competency frameworks and education curricula were cited within the identified articles, hand-searching was conducted of all professional regulatory body websites and websites of universities from countries with well-established APP roles (i.e., UK, Canada, Australia). This scoping review also included consultation with leaders in MSK physiotherapy education from those countries to ensure inclusion of all known advanced practice specific frameworks and education curricula, and to gain valuable insights (Arksey and O'Malley, 2005).

#### 2.3.2. Survey of physiotherapists in Ireland

Based on the review of APP competency frameworks and education curricula, as well as the experiences of MSK physiotherapy education providers, a survey instrument was designed. This survey provided a list of potential curriculum topics and asked respondents to prioritise these, as utilised in previous healthcare research (Ardoin et al., 2019). This initial survey was reviewed for comprehensiveness by APPs and the final survey included 29 learning topics under each of the themes emerging from the identified MSK APP competencies and education curricula, with opportunity given to the physiotherapists to recommend further learning priorities. The survey was then distributed at an advanced practice research and education symposium hosted at University College Dublin, Ireland, in August 2018, which included presentations from researchers in the field of advanced practice from Ireland and Canada, and an open audience discussion. This was attended by physiotherapists, physiotherapy managers, health and social care professional representatives, rheumatology consultant doctors and physiotherapists in academic roles in Ireland.

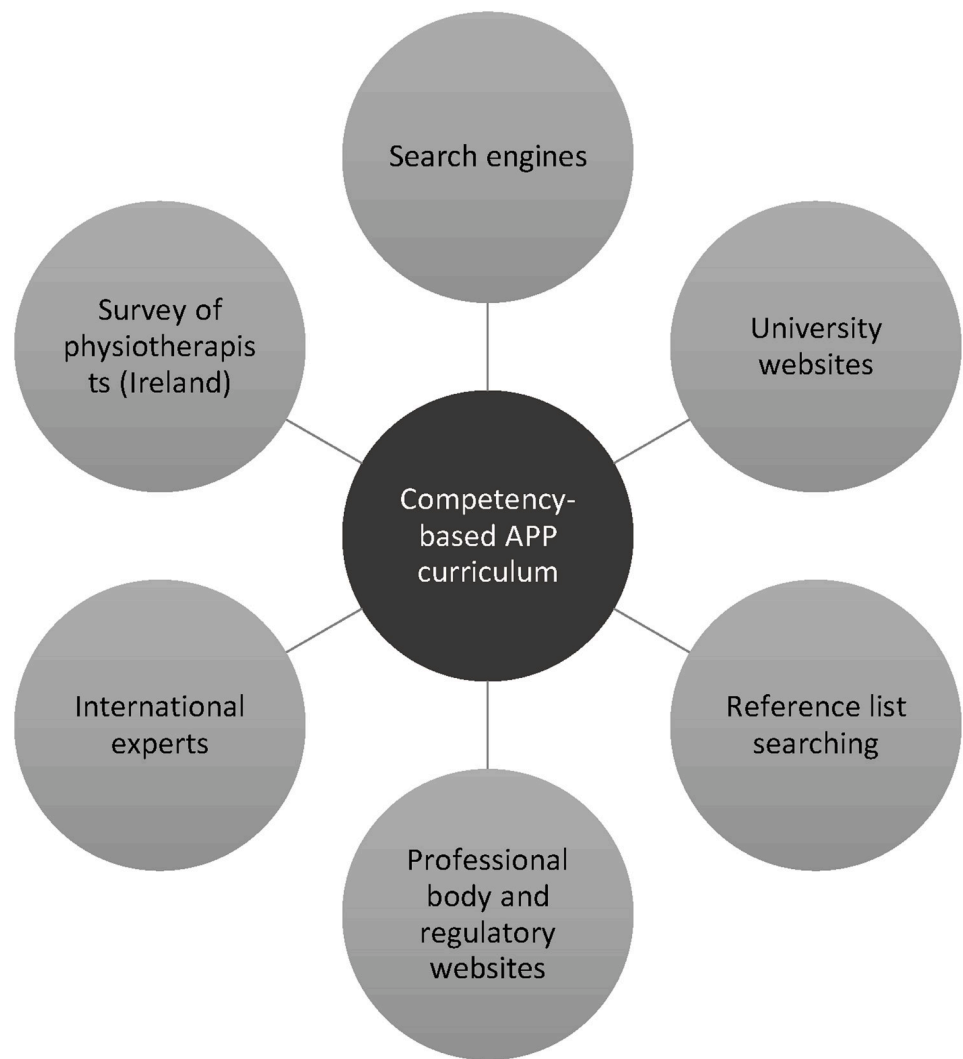


Fig. 1. Data sources to identify APP competencies, education programmes and learning priorities.

**Table 1**  
Inclusion and exclusion criteria for APP competency frameworks and education curricula.

Inclusion criteria	Exclusion criteria
Relevant to MSK physiotherapists (may also include other healthcare professionals or specialities)	Education curricula not specifically for development of skills which are deemed to be of advanced practice (e. g., MSK specialism only)
Must specify advanced practice	Programmes not actively recruiting students
Education programmes must be postgraduate formal or structured education, led or partially led by higher education institutions which lead to either a Diploma or Masters (i.e. level 7 European Qualification Framework or level 9 Irish National Qualification Framework ( <a href="#">National Qualifications Authority of Ireland, 2009</a> ))	
Education curricula modules available to the researcher	

2.4. Data charting

Standardised proformas on Excel (Microsoft Office 365) were used by the researcher to chart data from the advanced practice (1) competency frameworks and (2) education curricula. The first proforma

included: title, country of origin, health disciplines and list of competencies. The second proforma included: university profile details, programme title, level of education and compulsory and optional module titles relevant to MSK physiotherapists.

2.5. Data analysis

Inductive (i.e., codes derived from the text) and deductive (i.e., pre-devised categories) content analysis ([Bos and Tarnai, 1999](#); [Hsieh and Shannon, 2005](#)) was utilised to review the competency frameworks and education curricular content, as utilised in similar research ([O'Donoghue et al., 2011](#)). There were two stages of content analysis: (1) competencies and (2) education curricular modules.

**In Stage 1**, an initial coding tree was derived iteratively from the international advanced practice competency frameworks by two researchers [a physiotherapist and MSK physiotherapy educator and researcher]. Each code was analysed thoroughly to ensure it represented the competencies included ([Fig. 2](#)).

**For Stage 2**, the codes identified during Stage 1 were applied to the modules from the curricula independently by the same two researchers. Discussion between the researchers resulted in the expansion and collapse of some of the initial codes, resulting in final consensus ([Fig. 2](#)).

Survey data were inputted onto Excel (Microsoft Office 365) for analysis. Descriptive statistics were used to analyse the number of physiotherapists who ranked each learning topic as high priority for an

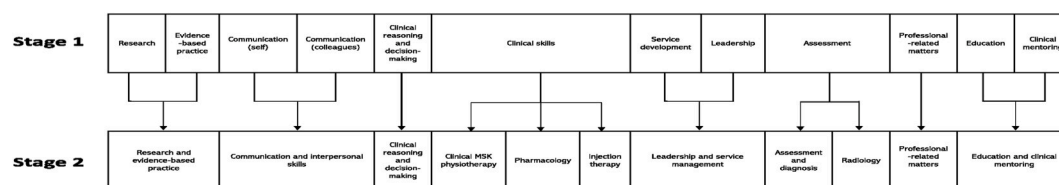


Fig. 2. Themes emerging from review of the identified MSK APP competency frameworks and education curricula during stage 1 and 2 of content analysis.

MSK APP education curricula.

## 3. Results

### 3.1. Advanced practice competency frameworks

Six APP competency frameworks were identified from the search of the literature (Harding et al., 2015; Jones et al., 2015) and websites; four from the UK and two from Australia (Table 2). All four UK frameworks were based on the four pillars of advanced practice (Clinical Practice, Facilitating Learning, Leadership, and Evidence, Research and Development) of which, one was MSK-specific (NHS Education for Scotland, 2012), three spanned disciplines (Welsh Government, 2011; NHS Education for Scotland, 2012; National Health Service (NHS), 2017) and one was specific to physiotherapists (Chartered Society of Physiotherapists, 2016). These frameworks have been utilised to demonstrate evidence of competence and CPD, to support career progression and professional body registration and accreditation, and to inform job descriptions (Chartered Society of Physiotherapists, 2016; Moloney et al., 2009; Jones et al., 2015; NHS Education for Scotland, 2012). The Scottish and Welsh frameworks provided self-assessment forms which asks the advanced practitioners to rate themselves on each competency and provide evidence to support this decision (Moloney et al., 2009; Jones et al., 2015), with the Welsh framework also providing a 360-degree feedback form to be completed by colleagues (Moloney et al., 2009).

Only the Australian frameworks were specific to MSK APPs and also provided 'specific-to-practice' competencies for different MSK settings (emergency departments, post arthroplasty review clinics, orthopaedic and neurosurgical physiotherapy-led screening clinics, spinal screening, post surgical, rheumatology, osteoarthritis hip and knee service, and specialist physiotherapy pain clinics) (Department of Health, 2014; Australian Physiotherapy Association, 2019). Additionally, a more formalised assessment was provided which must be conducted with a clinical mentor (i.e., APP with a minimum of two years-experience or medical consultant within their speciality) (Goodman et al., 2018). Despite the discrepancies between these frameworks, common themes emerged regarding the included competencies; *Professional-related Matters* (e.g., scope of practice, governance systems), *Clinical Reasoning and Decision-making*, *Education*, *Clinical Skills*, *Assessment and Communication (with colleagues)* and *Communication (with patients)*. Themes of *Research*, *Evidence-based Practice*, *Clinical Mentoring*, *Leadership* and *Service Development*, were only identified in the UK frameworks.

### 3.2. MSK APP university-led education curricula

Eleven advanced practice education curricula relevant to MSK physiotherapists were identified from the search of the literature (Goodman et al., 2018; Lunden et al., 2008, 2011, 2013; Lineker et al., 2011; Warmington et al., 2015) and university websites; predominantly UK-based (n = 9), one in Australia and another in Canada [Appendix]. Reflecting the competency frameworks, these education programmes targeted multiple disciplines and specialities, with only three programmes specific to physiotherapy. Both the Australian and Canadian APP MSK education curricula led to a Diploma qualification, whereas the UK education programmes could be completed to achieve a Masters. Pre-requisites for entering the APP education programmes varied from a

minimum 10 months (full time) to five years of clinical experience and some courses required the prospective students to demonstrate support of their line manager and a designated mentor.

Based on the titles of compulsory and optional modules deemed relevant to MSK physiotherapy, the same themes were identified as in the above competency frameworks. However, some of these were expanded or collapsed to cover the module topics; *Assessment (Assessment and Diagnosis and Radiology)* and *Clinical Skills (Pharmacology, Injection Therapy, Clinical MSK Physiotherapy Skills)*. *Research and Evidence-based Practice* was evident in all but one education curriculum, and *Assessment and Diagnosis*, *Pharmacology*, *Leadership and Service Management*, and *Professional-related matters* were identified across more than 60% of education curricula (Table 3) but varied between being mandatory or optional in each education programme. Less common across the education curricula (>40%) were *Injection Therapy*, *Communication and Interpersonal Skills*, *Radiology*, and *Education and Clinical Mentoring* (Table 3).

### 3.3. Survey of physiotherapists in Ireland

The learning priorities survey was completed by 25 physiotherapists in attendance at the APP symposium, including those already operating at an advanced practice level (n = 14). Over 70% of the participating physiotherapists ranked the following themes as high priority: *Radiology*, *Assessment and Diagnosis*, *Clinical Reasoning and Decision-making*, and *Research and Evidence-based Practice* (Table 4). However, some of the learning priorities under these themes were not rated as highly such as *Haematology* and *Shared Decision-making*. Additionally, learning priorities under *Clinical MSK Physiotherapy* were often not considered to be of high priority with less than 16% of physiotherapists deeming *Manual Therapy* to be of high priority for an APP education curriculum.

## 4. Discussion

### 4.1. Main findings

This study provides an in-depth review of international APP MSK competency frameworks and education curricula for the first time, and identified the common themes relating to professional and clinical capabilities expected of MSK APPs internationally. Additionally, learning priorities under each of these themes were ranked as high by physiotherapists in Ireland. Despite the variances existing in advanced practice physiotherapy both between and within countries (Fennelly et al., 2017), findings indicate that it would be feasible to adopt standardised MSK APP competencies and education standards using the common themes identified in this study as a foundation, as advocated for by the *World Confederation of Physical Therapists* (2019). This would likely enhance workforce mobility, role legitimacy and service quality, and facilitate lobbying for recognition and remuneration (Distler, 2007).

### 4.2. Clinical advanced practice competencies

Learning priorities which were perhaps considered to be entry-level physiotherapy skills, such as *Exercise Prescription*, *Manual Therapy* and *Shared Decision-making*, were not deemed by many of the surveyed physiotherapists to be of high priority for a MSK APP education



**Table 2**

Identified international competency and/or capability frameworks which encompass advanced practice physiotherapy.

Framework	Country	Disciplines	Competencies/Capabilities		
<i>Framework for Advanced Nursing, Midwifery and Allied Health Professional Practice in Wales</i>	Wales	Nursing, midwives, physiotherapists, occupational therapists.	<b>1. Management and Leadership</b> <ul style="list-style-type: none"> <li>- Change management</li> <li>- Negotiation &amp; influencing skills</li> <li>- Networking</li> <li>- Team development</li> </ul> <b>2. Education</b> <ul style="list-style-type: none"> <li>- Principles of teaching and learning</li> <li>- Supporting others</li> <li>- Promotion of learning</li> <li>- Carer teaching &amp; information giving</li> <li>- Developing education materials</li> <li>- Teaching, mentorship &amp; coaching</li> </ul>	<b>3. Research</b> <ul style="list-style-type: none"> <li>- Access information systems</li> <li>- Critical appraisal</li> <li>- Audit/service development</li> <li>- Implement research findings</li> <li>- Presentations &amp; publications</li> </ul> <b>4. Advanced Clinical Practice</b> <ul style="list-style-type: none"> <li>- Decision-making &amp; problem-solving</li> <li>- Critical thinking &amp; analytical skills</li> <li>- Managing complexity</li> <li>- Clinical governance</li> <li>- Equality and diversity</li> </ul>	<ul style="list-style-type: none"> <li>- Ethical decision-making</li> <li>- Assessment, diagnosis referral, discharge</li> <li>- Developing higher levels of autonomy</li> <li>- Assessing and managing risk</li> <li>- Non-medical prescribing</li> <li>- Confidence</li> <li>- Therapeutic interventions</li> <li>- Higher level communication skills</li> <li>- Public involvement</li> <li>- Promoting and influencing others</li> <li>- Advanced psycho-motor skills</li> </ul>
<i>AHPs Advanced Practice Education and Development Framework (Musculoskeletal)</i>	Scotland	Physiotherapists, occupational therapists, radiographers, chiropractors & podiatrists.	<b>1. Clinical Practice</b> <ul style="list-style-type: none"> <li>1.1. Communicate effectively</li> <li>1.2. Collect information</li> <li>1.3. Interpret information &amp; clinical decision-making</li> <li>1.4. Take appropriate action</li> <li>1.5. Promote health and well-being</li> <li>1.6. Operate within scope of practice</li> </ul> <b>2. Facilitating Learning</b>	<ul style="list-style-type: none"> <li>2.1. Learning environment</li> <li>2.2. Facilitation of learning</li> <li>2.3. Quality assurance</li> <li>2.4. Service improvement</li> </ul> <b>3. Leadership</b> <ul style="list-style-type: none"> <li>3.1. Self</li> <li>3.2. Team</li> <li>3.3. Organisation</li> </ul>	<b>4. Research</b> (e.g., evidence-based practice; service evaluation; research; governance issues) <b>5. Integrated capabilities</b> <ul style="list-style-type: none"> <li>5.1. Facilitating evidence-based practice</li> <li>5.2. Acting as an advisor</li> <li>5.3. Managing information</li> </ul>
<i>Multi-professional framework for advanced clinical practice in England</i>	England	Nursing, pharmacy, paramedics, occupational therapy, physiotherapy etc.	<b>1. Clinical Practice</b> <ul style="list-style-type: none"> <li>1.1. Professional conduct</li> <li>1.2. Scope of practice</li> <li>1.3. Professional judgement</li> <li>1.4. Assessment methods (e.g., diagnostic tests)</li> <li>1.5. Effective communication skills</li> <li>1.6. Clinical reasoning and decision-making</li> <li>1.7. Interventions (e.g., prescribing medications; lifestyle advice)</li> <li>1.8. Manage risk appropriately</li> <li>1.9. Work collaboratively</li> <li>1.10. Clinical role model</li> <li>1.11. Subject-specific competencies</li> </ul> <b>2. Leadership and Management</b> <ul style="list-style-type: none"> <li>2.1. Develop effective relationships</li> </ul>	<ul style="list-style-type: none"> <li>2.2. Person-centred approach</li> <li>2.3. Self and team evaluation</li> <li>2.4. Peer review</li> <li>2.5. Service development</li> <li>2.6. Seek feedback &amp; involvement</li> <li>2.7. Provide consultancy across professional &amp; service boundaries</li> <li>2.8. Leadership</li> <li>2.9. Practice development</li> <li>2.10. Receptiveness to challenges</li> <li>2.11. Negotiate scope of practice</li> </ul> <b>3. Education</b> <ul style="list-style-type: none"> <li>3.1. Assess own learning needs</li> <li>3.2. Self-directed learning</li> <li>3.3. Appraise others</li> </ul>	<ul style="list-style-type: none"> <li>3.4. Advocacy</li> <li>3.5. Facilitate collaboration</li> <li>3.6. Support team members to address developmental needs</li> <li>3.7. Support work-based &amp; inter-professional learning</li> <li>3.8. Educator/mentor</li> </ul> <b>4. Research</b> <ul style="list-style-type: none"> <li>4.1. Engage in research</li> <li>4.2. Evaluation and audits</li> <li>4.3. Use results to underpin practice</li> <li>4.4. Identify gaps in evidence base</li> <li>4.5. Identify needs to strengthen evidence</li> <li>4.6. Develop and implement governance systems</li> <li>4.7. Dissemination</li> <li>4.8. Facilitate collaborative links between clinical practice and research</li> </ul>
<i>Advanced practice physiotherapy: an evaluation tool</i>	United Kingdom	Physiotherapy	<b>1. Physiotherapy Knowledge</b> <ul style="list-style-type: none"> <li>1.1. Relevant to the area of practice &amp; scope of practice</li> <li>1.2. Political, social, economic &amp; institutional factors</li> <li>1.3. Self-awareness</li> </ul> <b>2. Physiotherapy practice skills</b>	<b>3. Interacting</b> <ul style="list-style-type: none"> <li>3.1. Communicating</li> <li>3.2. Helping others learn and develop</li> </ul> <b>4. Promoting integration and teamwork</b> <ul style="list-style-type: none"> <li>4.1. Integration and teamwork</li> <li>4.2. Person-centred practice</li> <li>4.3. Respecting and promoting diversity</li> </ul>	<b>5. Problem-solving and decision making</b> <ul style="list-style-type: none"> <li>5.1. Ensuring quality</li> <li>5.2. Improving &amp; developing services</li> <li>5.3. Lifelong learning</li> <li>5.4. Practice decision-making</li> <li>5.5. Researching and evaluating practice</li> <li>5.6. Using evidence to lead practice</li> </ul>

(continued on next page)

Table 2 (continued)

Framework	Country	Disciplines	Competencies/Capabilities		
Advanced Musculoskeletal Physiotherapy Clinical Education Framework	Australia (Victoria)	Physiotherapy	2.1. Profession-specific practice skills 2.2. Practical and technical skills shared with others <b>1. Professional Behaviours</b>	4.3. Apply the use of radiological investigations 4.4. Apply the use of pathology tests (under direction and supervision of a consultant) 4.5. Apply the use of therapeutic medicines (under direction and supervision of a consultant) 4.6. Apply advanced clinical decision-making 4.7. Formulate and implement a management plan 4.8. Monitoring and escalation 4.9. Obtain patient consent 4.10. Document patient information	<b>5. Specific to practice competencies</b>  - Fractures and simple joint reductions - Basic wound care - Paediatric MSK conditions - MSK conditions in patients with diabetes - Acute and persistent pain conditions - Spinal pain - Limb pain - OA of hip or knee - Following THR or TKR
			1.1. Operate within scope of practice 1.2. Accountability <b>2. Lifelong Learning</b>  2.1. Demonstrate a commitment to lifelong learning <b>3. Communication</b>  3.1. With colleagues <b>4. Provision and Co-ordination of Care</b>  4.1. Evaluate referrals 4.2. Perform health assessment/examination		
APA National Advanced Musculoskeletal Physiotherapy Competency Framework: Standard of Practice	Australia	Physiotherapy	<b>1. Professional Behaviours</b>  1.1 Operate within scope of practice 1.2 Display accountability <b>2. Lifelong learning</b>  2.1 Demonstrate a commitment to lifelong learning <b>3. Communication</b>  3.1 With colleagues 3.2 With patients	<b>4. Provision and co-ordination of care</b>  4.1 Evaluate referrals 4.2 Construct and perform assessments 4.3 Apply the use of radiological investigations 4.4 Apply the use of pathology tests 4.5 Apply the use of therapeutic medicine 4.6 Apply advanced clinical decision making to formulate differential diagnoses 4.7 Formulate and implement management plans 4.8 Evaluate and appraise a patient with complex morbidities 4.9 Evaluate and appraise in the context of a paediatric patient 4.10 Monitor and escalate care	<b>5. Effective component specific to clinical setting:</b>  5.1 Evaluate and appraise patients within a specific cohort 5.2 Formulate management plans for patients within a specific cohort 5.3 Provide basic wound care for patients in a specific cohort - Emergency - Orthopaedics - Spinal - Post Surgical - Rheumatology

Table 3

Modular themes represented across advanced practice education curricula.

Themes	University Programmes (n = 11) % (n)
Research and Evidence-based practice	90.9 (10)
Assessment and Diagnosis	81.8 (9)
Pharmacology	81.8 (9)
Clinical MSK Physiotherapy	72.7 (8)
Leadership and Service Management	72.7 (8)
Clinical Reasoning and Decision-making	63.6 (7)
Professional-related Matters	63.6 (7)
Education and Clinical Mentoring	36.4 (4)
Radiology	27.3 (3)
Communication and Interpersonal Skills	18.2 (2)
Injection Therapy	18.2 (2)

**Note:** Modules related to neurology and/or respiratory were excluded. Both compulsory and non-compulsory modules were included.

curriculum. However, the importance of enhancing these skills for APPs should not be underestimated, with a recent study highlighting the value patients place upon the unique combination of advanced MSK knowledge and management skills available from attending an APP, and the importance of shared decision-making (Fennelly et al., 2020). Conversely, tasks often deemed to be traditionally-medically controlled such as *Radiology* and *Pharmacology*, were frequently prioritised. Clinical imaging decision-making and related communications have also been reported as integral to APP practice in Ireland (Fennelly et al., 2018b; O Mahony et al., 2016), despite prescription of ionising radiation and medications being outside the physiotherapy scope of practice. Such legislative barriers also exist in other countries with only physiotherapists in certain regions of Canada and Australia permitted to order clinical imaging (Chong et al., 2015), whereas in the UK, in addition to diagnostic imaging rights, trained physiotherapists can also prescribe certain medications (Chartered Society of Physiotherapists, 2012). These variances in scope of practice, existing both across and within countries, renders standardised education and competencies as

**Table 4**

Topics deemed high priority for Advanced Practice Physiotherapy Education/Continuous Professional Development (n = 25).

Theme	Learning Priority	Physiotherapists % (n)
Radiology	Clinical imaging prescription of ionising radiation	80 (20)
Assessment and Diagnosis	MSK pathology	72 (18)
	MSK assessment and diagnosis	68 (17)
	Rheumatology	56 (14)
	Haematology	40 (10)
Clinical reasoning and decision-making	Critical thinking in MSK practice	72 (18)
	Clinical decision-making	72 (18)
	Shared decision-making in clinical practice	40 (10)
Research and Evidence-based Practice	Evidence-based practice	72 (18)
	Developing clinical practice guidelines	68 (17)
	Action research	44 (11)
Education and Clinical Mentoring	Experiential learning with clinical mentor in clinical setting (practice-based learning)	68 (17)
	How to become an effective clinical educator/mentor	32 (8)
	Presentation and knowledge sharing skills	32 (8)
Leadership and Service Management	Service development and evaluation	64 (16)
	Leadership	56 (14)
	Clinical audit	56 (14)
	Outcome measurement	52 (13)
	Integrated MSK care models	52 (13)
	Data management	48 (12)
Injection Therapy	Injection therapy	52 (13)
Communication and Interpersonal Skills	Communication	52 (13)
	Behaviour change approaches	44 (11)
	Brief intervention training	36 (9)
Pharmacology	Pharmacology/prescription of medications	48 (12)
Professional-related Matters	Professional advocacy/promoting profession	44 (11)
Clinical MSK Physiotherapy	Exercise prescription	32 (8)
	Enhancing practice through technology	28 (7)
	Manual therapy	16 (4)

challenging. However at the same time, education providers endeavour to deliver programmes that prepare graduates for work in an ever evolving system (Crane and Delany, 2013), and pharmacological knowledge and ability to interpret investigations may still be important to APPs irrespective of legislation.

#### 4.3. Professional advanced practice competencies

As highlighted earlier, consistency in advanced practice competencies facilitates workforce mobility and transferability of skills but discrepancies currently exist. *Leadership*, which is considered an important competency when undertaking an advanced practice role (McGowan et al., 2018), is not included as a competency in either the Australian MSK APP competency frameworks (Australian Physiotherapy Association, 2019, Department of Health, 2014) or recent exploratory studies of APPs in primary care (Suckley, 2012; Langridge, 2019). Similarly, APPs are asked to mentor their colleagues as part of several of the education programmes, however, developing the competencies of *Clinical Mentoring* and *Communication* were rarely identified within the education curricula or as high priority for education by the surveyed physiotherapists. Perhaps, these skills do not need to be specific modules but they should be incorporated across the post-graduate education programme (Madi et al., 2019).

#### 4.4. Education provision

Whilst this study included only MSK education curricula and competency frameworks specific to advanced practice, many others exist which cover many of the same competencies. This includes the *Musculoskeletal Core Capabilities Framework for First Point of Contact Practitioners* (UK) (Health Education England, 2018) and the *International Federation of Manual Physical Therapists (IFOMPT) Educational Standards in Orthopaedic Manipulative Therapy* (IFOMPT, 2016). As the IFOMPT standards already provide an internationally-recognised governance framework for MSK physiotherapy education, adaption of this framework to encompass the additional identified competencies would perhaps facilitate the expansion of MSK post-graduate offerings. Given the high level of CPD and graduate qualifications of physiotherapists seeking the additional advanced level competencies (Fennelly et al., 2018b), flexibility within education programmes, which might include recognition of prior learning (Lundon and Shupak, 2018), is recommended. As is provision of funding and support of health system management for completion of this education, as happens for other professions to support workforce planning. Other aspects of education provision include experiential learning, which has long been deemed an important component of APP training (Stevenson et al., 2020; Fennelly et al., 2018b; Gilmore et al., 2011; Weatherley and Hourigan, 1998; Ellis et al., 2005), and interprofessional learning which was common place across the identified education curricula. Interprofessional learning and cross-disciplinary advanced practice competencies are often utilised and can improve the quality of care (WHO, 2010) and may promote standardisation and recognition of the use of the 'advanced practice'. However, this has also led to more generic and ambiguous competencies, and the different levels of autonomy between professions may present challenges e.g., physiotherapists operate as first contact practitioners.

#### 4.5. Strengths and limitations

This study included a broad search of the international literature and websites, as well as consultation with international experts. Although the learning priorities for MSK APP education curricula were reviewed by only a subgroup of physiotherapists in Ireland and may not be generalisable, the learning topics included in the study were informed by the international MSK APP literature and experts, and APPs in Ireland have similar education levels and undertake similar tasks to APPs in the UK, Australia and Canada (Fennelly et al., 2017, 2018b). Expansion of this survey to other jurisdictions and stakeholders (e.g., consultant doctors, managers, educators, physiotherapy bodies) would build on these findings to inform international APP education models taking local context, legislation and professional scope of practice into account.

#### 5. Conclusion

This paper provides an overview of international MSK APP competency frameworks and education curricula, which acts as a foundation to enhance and standardise MSK APP education. This should ultimately enhance APP practice, bring greater recognition for advanced practice and helping to establish clearer physiotherapy career progression pathways whilst enabling workforce mobility.

#### Contributions to paper

- All authors were involved in interpretation of the data and writing the paper.
- OF collected the data. OF and CC analysed the data.

#### Conflicts of interest

None to declare.



## Ethical approval

The Human Research Ethics Committee at University College Dublin approved conduct of this study (LS-E-19-82-Fennelly-Cunningham).

## Funding

Not applicable.

## Acknowledgements

This project was in part supported by F. Desmeules' Canadian Institutes Health Research (CIHR) Young Investigator in Rehabilitation Award.

## Appendix

Database	Search Strategy
PubMed	<p>"Physical Therapists"[Mesh] OR "Physical Therapy Specialty"[Mesh] OR Physiotherapy OR Physiotherapist OR "Physical Therapy" OR "physical Therapist"</p> <p>AND</p> <p>"Advanced practice" OR "extended scope" OR "extended role" OR "advanced clinician" OR "advanced practitioner"</p> <p>AND</p> <p>"Education"[Mesh] OR "Teaching"[Mesh] OR "Curriculum"[Mesh] OR "Competency-Based Education"[Mesh] OR "Clinical Competence"[Mesh] OR education OR training OR teaching OR curriculum OR curricula OR competency OR competencies OR capability</p>
CINAHL	<p>(MH "Physical Therapy+") OR Physiotherapy OR Physiotherapist OR "Physical Therapy" OR "physical Therapist"</p> <p>AND</p> <p>"Advanced practice" OR "extended scope" OR "extended role" OR "advanced clinician" OR "advanced practitioner"</p> <p>AND</p> <p>(MH "Clinical Competence+") OR (MH "Professional Competence+") OR (MH "Curriculum+") OR ((MH "Education+") OR education OR training OR teaching OR curriculum OR curricula OR competency OR competencies OR capability</p>

**Note:** MeSH, Medical Subject Heading in PubMed; MH, Subject Heading in CINAHL; +, Term exploded in CINAHL.

## Appendix

University	Programme Title	Core Modules	Optional Modules
University of Toronto	Advanced Clinician Practitioner in Arthritis Care (ACPAC) Program	Basic Science Theory Underlying Musculoskeletal Practice Foundations of Clinical Practice Therapeutic Management Rheumatology Musculoskeletal and arthritis care electives (x2)	N/A
University of Canberra	Postgraduate Diploma in Extended Scope Physiotherapy	Injection therapy Pharmacology Radiology Leadership Evidence based practice Clinical Practice	N/A
Coventry University	MSc Advanced Clinical Practice	Advanced Practice Clinical Health Assessment Advanced Clinical Practice Clinical Competence for Advanced Health Assessment and Decision-making Clinical Competence for Advanced Clinical Practice Clinical Leadership Research methodology, design and methods Independent Advancing Practice Project	Ethics and Law for Professional Practice Non-Medical Prescribing Independent Study Supporting learning and assessment in health and social care settings Contemporary perspectives of care for individuals with long term conditions Managing minor injury and illness
Cardiff University	MSc in Advanced Clinical Practice	Advanced Clinical Practice Portfolio Exemplifying Evidence-based practice Research methods and health improvement in health and social care	Study skills Facilitating Learning and Teaching Ethics in Health and Social Care Musculoskeletal Diagnosis and Treatment Foundation in Advanced Clinical Assessment for Healthcare Professionals Evidencing Learning in Specialist Professional Practice Public Health, Health Economics and Policy Research methods and data analysis Decision-making and managing complex care Clinical Patient Assessment for Health Professionals; Patient Safety and Clinical Risk Non-Medical Prescribing Transforming Care, Systems and Services through Leadership Facilitating Practice Based Learning (Mentorship Preparation) Development of Leadership Skills in Health and Social Care
University of Liverpool	Advanced Practice in Healthcare MSc/ PGDip/PGCert	Overview of Research Methodologies for Health Professionals Dissertation Context of Advanced Practice	

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University	Programme Title	Core Modules	Optional Modules
			Negotiated Work Based Learning - Developing Practice Skills Mentorship Through Action Learning in Health and Social Care Concepts of Management in Musculoskeletal Trauma Clinical Skills and Diagnostics adult Musculoskeletal Leg Critical Clinical Reasoning and Thinking for Healthcare Professionals Diagnosis & Triage of Upper Limb Musculoskeletal Conditions; Managing Complexity in Clinical Environments Supporting Learning in Professional Practice (Multi-professional Support of Learning and Assessment in Practice) Non-medical Prescribing Practice (independent and Supplementary Prescribing) Essentials of Pharmacology for Non-Medical Prescribing Principles and Practice of Qualitative Research Impact of Human Factors and Ergonomics on Patient Safety in Healthcare Clinical Education (practice & Theory) for Orthoptists Diagnosis and Triage of Lower Limb Musculoskeletal Disorders The Diagnosis and Triage of Spinal Musculoskeletal Conditions Practical Aspects of Image Guidance for Radiotherapy Generating and Using Professional Evidence Practice Educators Introductory Course Therapeutic Communication Skills for Advanced Practice Leadership in Professional Practice N/A
University of Nottingham	Advanced Clinical Skills	History Taking Clinical Examination and Decision-making Non-Medical Prescribing Developing Advanced Clinical Skills Through Work Based Learning Evidence for Health and Social Care Leadership in Health and Social Care Advancing Practice Clinical Project/Dissertation	
University of Southampton	Advanced Clinical Practice (Advanced Allied Health Practitioner)	Research Methods for Evidence Based Practice History Taking and Physical Assessment Across the Lifespan Diagnostic Assessment and Decision-Making; Pharmacology and Prescribing in Clinical Practice Transition to Advanced Practice (Advanced Nurse Practitioner and Advanced Allied Health Practitioner); Dissertation	N/A
University of Birmingham	Advanced Clinical Practice and new programme Advanced Practice in Healthcare (Global) MSc/PGDip/PGCert	Advanced Health Assessment and Clinical Decision-Making Project Management and Research Governance Leadership in Advanced Clinical Practice Research Project/Dissertation	Prescribing: scientific principles and safe practice Prescribing: safe effective practice Quantitative Methods in Healthcare Mixed Methods Research Designs Current Issues in Health Introduction to Leadership and Management for Health Health Care Evaluation and Commissioning Qualitative Research Methods Systematic Reviews and Evidence Synthesis Epidemiology Statistics and Research Methods Occupation as the Focus of Contemporary Practice Injection Therapy for Health Professionals (Botulinum Toxin) Injection Therapy for Health Professionals (Corticosteroid) Pathomechanics and Rehabilitation of Gait and Balance Advanced Critical Reflection, Risk and Decision-Making International Perspectives and Practice Requirements for Health and Social Care Practitioners Assessment and Management of Foot and Lower Limb Musculoskeletal Conditions; Facilitating Collaborative Patient Management and Flow Leading Professionals, Managing Aspirations for Self and Others Innovation in an Ever Changing Marketplace - Entrepreneurship for Health and Social Care Professionals Advanced Clinical Reasoning in Musculoskeletal Conditions
University of Plymouth	Advanced Professional Practice in Physiotherapy	Applying Evidence to Practice Project Design for Research Research Dissertation Physiotherapy Practice Supported Study	

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University	Programme Title	Core Modules	Optional Modules
Queen Margaret University	Advancing Practice in Health Framework	N/A	Advanced Competencies (pre agreed work place competencies) Assessment and Feedback (educational role - variety of assessment and feedback methods) Community Health and Wellbeing Theory Diagnostic Investigations for Current Practice Dissertation Delivering Impact in Practice Enquiry-based Practice (research principles, methodologies and analysis) Facilitating Learning Fundamentals of Advancing Practice Leadership and Business Management Management of Diabetes and its Complications MRI/CT in Practice Medical Imaging of the Foot and Ankle Non-medical Prescribing for Allied Health Professions Principles of MRI/CT Principles of Diabetes and its Complications Realistic medicine (interventions improve health outcomes related to lifestyle behaviours) Tissue viability
Bucks New University	MSc Advanced Clinical Practitioner	Physical Assessment of the Adult Clinical Reasoning Skills for Advanced Practice Generating Knowledge for Practice Dissertation	Leadership, Management and Professional Issues Applied Pharmacology for Non-medical prescribing. Clinical decision-making for Non-medical prescribing Emergency and Unscheduled Care Minor Injury Management

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