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Global expansion of the Physician Assistant profession: healthcare system needs, scope of practice and future directions

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GLOBAL EXPANSION OF THE PHYSICIAN ASSISTANT PROFESSION: HEALTHCARE SYSTEM NEEDS, SCOPE OF PRACTICE AND FUTURE DIRECTIONS

by

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GLOBAL EXPANSION OF THE PHYSICIAN ASSISTANT PROFESSION: HEALTHCARE SYSTEM NEEDS, SCOPE OF PRACTICE AND FUTURE DIRECTIONS

CAROLYN KUSSMAUL

ABSTRACT

Background

The World Health Organization predicts that by 2030 there will be a shortage of more than 14 million healthcare workers. Fifty years ago, to help address the growing demand for medical providers, the United States created a new medical profession, the Physician Assistant. Since 2000, several other countries including Australia, Canada, Germany, Great Britain, India, Israel, Ireland, New Zealand, Saudi Arabia, Scotland, South Africa, and The Netherlands have developed or are developing their own PA-like profession.

Literature review findings

This thesis contains a comprehensive literature review, composed largely of small pilot and qualitative studies, which summarizes the introduction and expansion of the PA profession in each country. The literature review highlights that around the globe the PA profession is unified by similar condensed medical education and training. However, there is presently a lack of literature on the current roles and tasks of PAs in each country.

Proposed project

This thesis proposes a qualitative study to identify each country's motivation for PA professional development, current scope of practice of PAs and future directions for the PA profession.

Conclusions

The results will be analyzed to reveal correlations, as well as unifying themes and characteristics that are shared among all PAs globally.

Significance: The compiled data will illuminate an emerging profession that is helping to alleviate the healthcare workforce shortage.

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LIST OF ABBREVIATIONS

AMTC…………………………………………...Accelerated Medically Trained Clinician

APN……………………………………………….....………Advanced Practice Nurse

ARC-PA…...Accreditation Review Commission on Education for the Physician Assistant

ART…………………………………………………...……….Antiretroviral Therapy

CanMEDS-PA …………….Canadian Medical Educational Directives for Specialists- PA

CCF…………...The Competence and Curriculum Framework for the Physician Assistant

ED……………………………………………………………Emergency Department

EMS………………………......…………………………Emergency Medical Services

GP…………………………………………………………….…General Practitioner

ICU……………………………………......…………………..Intensive Care Unit

IRB………………………………………………………….…Institutional Review Board

NAPA…………………………………… Netherland Association of Physician Assistants

NCD…………………………………………………...Non-communicable disease

NP……………………………………………………………………….Nurse Practitioner

NPC…………………………………………………………Non-physician clinician

NHS…………………………………………………………National Health Service

OSCE………………………………………Objective Structured Clinical Examination

PA……………………………………………………………..Physician Assistant

PACASA………………..Professional Association of Clinical Associates in South Africa

PSMCHS………………...…………….…Prince Sultan Military College of Health Sciences

SA………………………………………………………………………….South Australia

UK……………………………………………………………………..…….United Kingdom

UKIUBPAE…………………...The UK and Ireland Universities Board for PA Education

US………………………………………………………………………....United States

WHO…………………………………………….……………World Health Organization

INTRODUCTION

Background

The Physician Assistant (PA) profession has existed in the United States (US) for 50 years, with PAs practicing in a variety of fields including primary care, emergency medicine and surgical and internal medicine subspecialties. Since 2000, the PA profession has expanded and become established beyond the US. PA and PA-like professions are developed and developing rapidly in numerous countries including Australia, Canada, Germany, India, Israel, Ireland, New Zealand, Saudi Arabia, South Africa, The Netherlands and The United Kingdom (UK). Increased interest in the global use of PAs has revealed that a PA-like workforce exists in more than 46 countries and in several of these countries, particularly in sub-Saharan Africa, the profession has been established and utilized for more than a century.[1–4] However, limited research exists on why PA professions were developed, how PAs are trained and their scope of practice outside the US. Additional information is needed on the variety of tasks PAs perform and patient populations served by PAs in each international country where the profession has developed or is developing.

Statement of the Problem

There is a significant and increasing shortage of healthcare providers globally. Currently, there is a worldwide deficit of about 4.3 million healthcare workers leaving an estimated one billion people without access to trained medical providers.[5,6] The World Health Organization (WHO) predicts the shortage will be more than 14 million by 2030.[7]

Several factors have contributed to the current crisis including migration of skilled healthcare workers, the aging global population and a shift towards further urbanization. Advancement of new technologies and bioscience has led to greater workforce specialization. Additionally, the prevalence and burden of non-communicable diseases (NCDs), such as cardiovascular disease, diabetes and chronic respiratory diseases, has risen.[5,6,8] Prevention, management and treatment of NCDs requires further growth of the global healthcare workforce and increases the need for team-based medicine.

To help improve global access to health care the WHO recommends task shifting. Task shifting involves transferring specific tasks from highly qualified health professionals, such as physician, to health professionals with shorter training and fewer qualifications.[9] The PA profession in the US is an example of the success of task shifting. US PAs work in a variety of fields and complete a broad range of tasks, the US PA training and profession will be used as a benchmark for comparison to the emerging global PA professions.

Globally, there are now more than 46 PA-like equivalent professions, while some of these healthcare workers have been an established presence for a century, others have only recently joined the arena or are still being developed.[2,10] Since 2000, there are currently twelve identified countries that have developed or are developing a new PA profession. Unfortunately, there is currently a dearth of literature on the training, roles and tasks of PAs in each of these countries. The available literature from each country consists of small pilot studies and qualitative studies. Further research is needed to assess the similarities and differences among PAs in each country. A comprehensive report of how different countries have molded the PA profession to meet individual needs can aid in further expansion of the PA profession globally while also shedding light on the professions impact in alleviating the increasing shortage of healthcare workers.

Hypothesis

Around the globe, countries have differing healthcare needs and health workforce gaps that can be filled by the PA profession.

Objectives and specific aims

Since 2000, twelve countries have new and emerging PA professions: Australia, Canada, Germany, Great Britain, India, Israel, Ireland, New Zealand, Saudi Arabia, Scotland, South Africa, The Netherlands and The UK. As the PA profession expands globally, there are several commonalities. The goals of this study will be to identify the unifying characteristics of PAs that have spread beyond the US.

1. Discern a rationale for each country that led to the introduction of PAs.
2. Determine PAs roles, tasks and scope of practice outside the US.
3. Identify barriers and challenges of the PA profession in each country.

REVIEW OF THE LITERATURE

Overview

The global health workforce shortage

The WHO estimated that the global health workforce consisted of 43 million in 2013.[7] While this may appear to be a robust number, the WHO reports that there is a current worldwide shortage of approximately 4.3 million healthcare workers.[3,5,9,11] This is equivalent to leaving at least one billion people without access to trained healthcare workers.[5] Healthcare access requires an adequate number of providers in diverse locations to meet a population's needs. There is a global supply and demand of healthcare workers. In general the supply of workers depends on the inflows (healthcare graduates and foreign-trained professionals who immigrate) and outflows (professionals who leave healthcare, professionals who emigrate and those who retire). Population, morbidity, health service utilization, and health care expenditure drive demand.[12] Currently, there is a widening gap between supply and demand. The gap is created by several factors such as aging populations, increases in NCDs with high care demands, technological advances, a further specialized workforce and insufficient development of healthcare providers.[3,5,9,11]

To make matters worse, healthcare workers are unevenly distributed across the globe and poorly dispersed within countries and regions. Health worker density is generally highest in urban areas with high incomes; about 75% of doctors can be found in urban areas, where only about 55% of all people live. With high concentrations of health professionals in urban areas, the disadvantaged, rural and poor areas often are unable to attract and retain health care staff.[5,11] As the distribution of health care services expands and the demand for services within all jurisdictions increases, the predicted shortage of staff also grows. The WHO projects that by 2030 there will be shortage of more than 14 million healthcare workers.[7] One proposed method to help reduce the shortage is implementation and growth of task shifting.

Task shifting and non-physician clinicians

In 2008, the WHO released recommendations on the use and expansion of task shifting to help alleviate the current shortage of healthcare workers. The guidelines were developed to help countries increase access to HIV prevention, care and treatment but can be applied and used to increase access to a variety of health services. Task shifting is when; "specific tasks are moved, where appropriate, from highly qualified health workers to health workers with shorter training and fewer qualifications in order to make more efficient use of the available human resources for health".[9] The use and success of task shifting has largely been seen in the care of HIV/AIDS. As antiretroviral therapy (ART) for HIV becomes more available in resource poor countries, management of HIV is now limited by shortages of healthcare professionals. Task shifting is used in ART programs to help reduce costs, increase access and improve efficiency. A systematic review of six studies with a total of 19,767 patients found that task shifting of ART programs could result in cost and time savings for physicians while resulting in similar patient outcomes.[13] Task shifting involves reorganization of health care delivery models, changes in scopes of practices and the development of new cadres of healthcare providers. One form of task shifting involves the use of non-physician clinicians (NCPs) or midlevel providers undertaking tasks that were once reserved for medical doctors.[9]

NCPs are one solution to the growing health worker shortage. A NCP is defined as a health care professional with more medical training than a basic nurse, but less than a physician. Examples of NCPs include PAs and advanced practice nurses (APNs) including nurse midwives, nurse practitioners (NPs), clinical nurse specialist and clinical registered nurse anesthetists. They have been trained to perform some of the same tasks as physicians; to identify, diagnose and treat common health conditions and deliver a range of clinical health services.[3,14] This midlevel profession has been present for more than a century, most prevalent in low-income countries and rural locations where other health professionals are scarce.[3]

NCPs have been investigated and identified in 47 sub-saharan African countries, many of which the WHO has identified as having a critical shortage of healthcare providers. They are educated in less time than a physician and their training is focused on local and indigenous health challenges. In several of the African countries, NCPs are the “backbone of the health system” and may even run health centers. Countries such as Rwanda, Uganda and Malawi, with low physician densities compensate with NCPs to increase access to medical care.[1] More recently, NCPs have emerged in both high and low income countries and are providing an equivalent quality of care when compared with physicians.[14]

With the NCP profession maturing, there has been an increased interest in identifying and documenting the different NCP types around the globe. Cobb et al. have coined the term Accelerated Medically Trained Clinicians (AMTCs) for these providers. This cadre exists in 46 countries throughout Africa, Asia, Europe, Oceania and North and South America. Data on the title, year of establishment, education, scope of practice, regulation, and number of professionals was collected from each of the 46 countries. In common among these professionals is a condensed education, which is shorter in duration than a physician's and based on the medical model, in contrast to advanced practice nursing training. Although the educational systems were similar across AMTCs, there were large variations in the regulation of training and practices and their scope of practice.[15] The paper demonstrates that there are numerous countries that have utilized the AMTC role to address the health workforce shortage. However there is still a shortage of information and literature on these health care professionals within their respective countries resulting in an invisible global workforce.[15,16] Cobb and her colleagues are among the first to compile information on the international group of professionals that is similar to the US PA profession.

PA education in the US

In the late 1940s and mid 1950s, the US population grew at the same time US physicians moved toward specialized medicine leading to a shortage in general practitioners. To address the impending shortage a new concept of a "physician extender" was devised. This extender would be molded to deliver primary care and complete tasks once only reserved for physicians. In 1965, Dr. Eugene A. Stead, Chairman of Medicine at Duke University made the extender concept a reality and began a program to train assistants of physicians or PAs. Stead's program started with training Vietnam veterans who were former military corpsmen and militarily trained medical personnel.[17] The early PA programs were designed to be efficient and provide a medical education in a shorter length of time than physician training. The programs were about two years in length and recruited students with extensive health care backgrounds. Ten years after Duke opened the first program, there were already 48 established PA programs.[18]

Today, there are 218 educational PA programs in the US. The programs are accredited by Accreditation Review Commission on Education for the PA (ARC-PA) and over 70 new programs are expected to receive provisional accreditation by 2020.[19,20] The average program is 27 months in length, with programs varying between 21 and 36 months.[19] While all programs are accredited and must comply with a core set of educational standards, the degree awarded still differs by institution. Students graduate with a masters, bachelors, associates degrees or certificates of completion.[19,21] However this is changing, the ARC-PA has mandated that by 2020 all programs must offer studies at a masters degree level. Currently, 95.9% of PA programs offer a masters degree, which is a remarkable contrast to 1995 when only 25% of PAs held masters degrees.[19,22]

The ARC-PA determines the curriculum requirements for didactic and clinical education to form a condensed medical education. The didactic portion is focused on evidence-based medicine and includes basic science courses in anatomy, physiology, pharmacology, and pathophysiology while learning medicine in an organ systems approach. Following approximately one-year of didactics, students complete about 2000 hours of clinical rotations in a variety of specialties and medical settings. Supervised clinical rotations are completed in family medicine, internal medicine, general surgery, pediatrics, psychiatry and obstetrics and gynecology as well as additional medical and surgical subspecialties.[23] Following completion of the program, graduates must pass the PA National Certifying Examination, a standardized exam administered by the National Commission on Certification of PAs. PAs, under physician supervision and collaboration, are then licensed to practice medicine in all states.[21]

PAs in the US workforce

Since its birth in 1965, the PA profession has flourished in the US. The profession has grown to help meet healthcare demands, particularly in the face of physician shortages. In 2003, The Accreditation Council for Graduate Medical Education put limitations on resident work hours, limiting training to 80 hours per week.[24] While the current number of medical graduates remains relatively unchanged, the resident work restrictions further exacerbate the shortage of physicians[22,25,26] By 2025, the Association of American Medical Colleges estimates that the shortage of physicians will be as high as 124,000, and primary care doctors will account for 37% of the deficit.[21] As the supply and demand gap increases, NPs and PAs will have to further help fill the void, especially in the areas more prone to physician shortages.

Since 2010, the PA profession has grown by 35.9% and by the end of 2015 there were 108,717 certified PAs practicing medicine throughout the US.[27] NPs and PAs account for about one sixth of the medical workforce, and approximately one quarter of them work in rural and underserved areas.[25] Similarly to when the profession was first devised, PAs continue to fill the health worker gap in underserved areas. A higher percentage of PAs work in rural and underserved areas than physicians.[28,29] Staton et al. performed a retrospective analysis of the National Ambulatory Medical Care Survey data from 1997-2003 and discovered that patients are about twice as likely to see a PA in rural areas than in urban areas (OR 2.02, CI 1.31-3.14), illustrating that PAs across the US continue to provide access to care where physician shortages are more prevalent, particularly rural areas.[29]

While primary care specialties such as family medicine and general medicine remain the most common area of clinical practice (28.3%), PAs also work in a variety of surgical subspecialties, emergency medicine, internal medicine subspecialty, general surgery, pediatrics and psychiatry. In addition to working in a vast selection of clinical specialties, PAs also practice in a wide distribution of settings including private practices, hospitals, rural and community health clinics, federal government facilities, rehabilitation and extended care centers, and occupational health.[27] Another unique aspect of the PA profession is that individuals can change specialties throughout their PA career. The flexibility and adaptability of the PA role has lead to its success and surge over the past 50 years. Early in its professional development throughout the 1960s-1980s, the literature on US PAs consisted only of small descriptive studies and opinion pieces, however as the profession grew literature expanded between 1980s to 2000s to include census surveys, annual reports, and national descriptive surveys. It was not until the mid 2000s that literature on patient outcomes associated with PA care emerged.[30] There is now a growing collection of literature of PAs and their impact on the US health system.

Existing research

PA roles and successes in the US

Initially, US PAs filled the physician shortage gaps in primary care ambulatory settings, but as the profession became more established, the scope and clinical arenas broadened. Beyond their use in rural and outpatient settings, PAs are working in a variety of inpatient settings. In the inpatient setting, PAs are restoring continuity of care, improving access and increase physician productivity by freeing up physicians' time for other activities. PAs work closely with their attending physician and have a wide scope of practice, including completing history and physicals, writing notes and orders, talking with consultants, discharging patients, providing patient education, and performing procedures.[31,32] PAs also have the authority to prescribe in all states, but state laws vary in specific prescribing privileges and the rights to prescribe controlled substances.[21,33] In one retrospective analysis, Roy et al. found that the hospitalist/PA service provided parallel care to a traditional medicine service (composed of an attending, senior resident, and interns). There was no significant difference found in inpatient mortality (OR 0.8, CI 0.3-1.8), ICU transfers (OR 1.4, CI 0.8-2.4), or 30 day readmissions (OR 1.1, CI 0.9-1.3).[34] In a second study four-year retrospective study, PAs were found to provide equivalent care to medical residents in a community hospital. All-cause mortality was significantly decreased (1.94% vs. 2.85%, $p < 0.001$) while adverse events (9 vs. 5, $p = 0.29$), 30 day readmission rates (64 vs. 69, $p = 0.34$), and patient satisfaction (95% vs.

96%, p = 0.33), were unchanged after the implementation of PAs.[35] The addition of PAs has led to safe and effective healthcare in hospital settings.

The presence of US PAs in surgical, emergency departments (ED) and critical care specialties is also well established. In surgical settings PAs act as first surgical assistants, in addition to providing preoperative and postoperative care. They help to reduce surgical resident workload and postoperative hospital length of stay.[21,36] A systematic review of 66 studies of PAs in the ED, demonstrated that PAs could perform a wide range of tasks, reduce ED wait times and provide equivalent care to ED physicians. PAs most often work in fast track units, but can also be found in triage, trauma and rural EDs where they perform a variety of tasks including history and physicals, ordering and evaluating diagnostic tests, providing treatment, performing procedures, admitting patients and communicating with consultants. Common procedures performed by PAs in the ED include nasogastric tubes, foley catheters, lumbar punctures, intubation, abscess drainage, arterial and central lines, chest tubes, wound sutures and wound care.[37] In critical care settings, such as the intensive care units (ICU) and trauma centers, PAs are having a positive impact on patient outcomes.[38,39] A retrospective study at a level I trauma center in Pennsylvania compared acute care outcomes before and after the introduction of PAs and NPs. Results indicated that there were no significant differences in hospital mortality (3.9% vs. 3.5%, p = 0.686), hospital length of stay (5.09 days vs. 4.84 days, p = 0.092), deep vein thrombosis (3.9% vs. 3.6%, p = 0.709) or major arrhythmia occurrence (1.9% vs. 1.2%, p = 0.135). There were a significant reduction in the occurrence of urinary tract infections (2.6% vs. 0.9%, = 0.0001) and ICU length of stay (4.08 days vs. 3.28 days, p = 0.019), arguing that the quality of care for patients in acute conditions was maintained and even improved with the integration of midlevel providers.[39] The PA profession, equipped with a general medical education, has proven that it can adapt and be successful in an array of clinical settings. Having seen the flexibility and achievements of the profession in the US, countries across the globe have looked to the US' PA model to help alleviate health workforce shortages.

The international PA movement

Canada

The first Canadian PA was developed by the military. The Canadian Navy required autonomous medical providers without deploying their trained physicians to sea.[40,41] In 1984, the Canadian Forces restructured the roles and tasks of the senior medical assistant and graduated the first class of PAs from the Canadian Forces Medical Service School in Borden, Ontario.[40,41] While the Canadian Forces benefitted from the medically trained PAs, the roles did not transfer over to the civilian sector. The Canadian Medical Association officially accredited the program in 2004. Graduates who complete the program obtain a bachelors degree in collaboration with University of Nebraska Medical Center, which is also affiliated with US military PA programs.[40–42] Today, Canadian military PAs have a broad scope of practice and can often act as a senior medical authority with a set list of medications, diagnostics and consultations they can order without co-signature of a physician.[40]

In the face of increasing physician shortages, poorly distributed healthcare resources and limited medical access in Canada's immense rural landscape, several Canadian provinces began to expand the PA profession into the civilian sector.[10,41,42] The first Canadian civilian PA programs began in 2008, at the University of Manitoba and McMaster University in Ontario. Two years later, a fourth program was established through the collaboration of the University of Toronto and the Northern Ontario School of Medicine. PA graduates of The University of Manitoba are awarded a master's of PA studies degree after completing the 26-month program. The remaining two programs are 24-month Bachelor of Science PA degrees, which require at least two years of undergraduate classes before attending.[42,43]

All graduates must pass a national certification exam through the PA Certification Council of Canada and meet a set of national competencies to begin practicing as a PA. The national competencies, the Canadian Medical Educational Directives for Specialists (CanMEDS-PA), was designed by the Canadian Association of PAs and modeled after The Royal College of Physicians and Surgeons of Canada CanMEDS.[42] The CanMEDS-PA was updated in 2015 and clearly lays out the roles, expectations and scope of practice of a Canadian PA, which includes completing patient histories, physical exams and diagnostic studies, writing prescriptions or carrying out other therapeutic interventions, and counseling on preventative medicine.[44]

There are currently more than 500 PAs practicing in Canada and that number is rapidly rising.[42] Healthcare delivery in Canada is specific to each of the country's ten provinces and three territories, as are the use and roles of PAs. The provinces with formal legislation currently regulating PA practice include Manitoba, Ontario, New Brunswick and Alberta, where the majority of PAs work in EDs and primary care settings.[42,43] Ontario introduced PAs into the healthcare workforce in 2006 as a way to alleviate healthcare costs by shifting some responsibilities from the physician to the PA in primary care settings. One qualitative study in Ontario explored physician's perceptions on the introduction of PAs and found that the physicians believed that PAs help to improve access to care, continuity of care, and decreased wait times; however many physicians lacked an understanding of the PA scope of practice and how much supervision PAs require.[45]

As a new profession within the Canadian healthcare system, there still is a lack of research on the specific roles and effects of Canadian PAs on healthcare outcomes. Only a few small studies have shown the initial impact of PAs on healthcare. Ducharme et al. analyzed wait times and length of stay of patients in six Ontario EDs and found a 30.4% (95% CI 21.6%-39.0%) reduction in length of ED stay after the introduction of PAs.[46] In Manitoba, the introduction of PAs in orthopedic surgical services between 2004 and 2006 contributed to almost twice as many annual procedures and increase from 462 to 1070 in 2006 and a reduction in patient procedure wait time from 44 to 33 weeks. Additionally, PAs were considered "important members of the healthcare team" by surgeons, residents, nurses, and patients.[47] The introduction of two PAs employed in a general surgery team in Toronto led to improvements in patient discharge and rounding efficiency, helped to reduce surgical resident workload and improved resident satisfaction while on the surgical rotation. The surgical PAs helped with morning rounds, patient discharges, history and physicals, assisted in surgeries and patient postoperative recovery.[48] Moving forward, further research and larger studies are needed on the use and success of PAs in Canada.

The Netherlands

The PA profession was introduced in the Netherlands, a country with universal health coverage, in 2001. The Dutch Ministry of Health, Welfare and Sport proposed the redistribution of tasks in healthcare by delegating tasks from physicians to other healthcare workers to make care more efficient.[49–51] The first PA program was started in 2001 at the University of Applied Sciences in Utrecht. Since then four more programs have been started in Nijmegen, Amsterdam, Groningen and Rotterdam. Prior to admission, PA applicants are expected to complete at least two years of clinical healthcare work. All five masters programs are 30 months in length and combine didactic and clinical hours from the beginning of the program. While completing didactics, students are employed as trainees by designated physician in a medical specialty to help better understand patient assessment, management and the healthcare environment in their first year. Later in the program, students rotate through different medical specialties and complete the program with a capstone masters thesis project.[49,51,52] Compared to several other countries, the Netherlands PA education system is more uniform with a set layout and curriculum shared by all five schools.

With more than 1,000 practicing PAs, the Dutch PA profession has continued to grow with the aid of its professional body, The Netherlands Association of PAs (NAPA).

In 2013, NAPA helped the profession gain legal recognition with the addition of amendments to the Individual Health Care Professions Act (the BIG law) which allowed PAs to perform predefined medical procedures such as endoscopies, catheterizations and elective cardioversion in addition to prescribing medications[53,54] The majority of Dutch PAs work in inpatient settings in a range of specialties including internal medicine, general surgery, surgical subspecialties, anesthesiology and cardiology.[53–55]

One study looked directly at the role NPs and PAs play in Dutch hospitals. A total of thirteen PAs were interviewed in 2007. The PAs spent 42% of their time completing tasks related to direct patient care and were competent in taking medical histories, completing physical exams, ordering lab tests, referring to consulting services, rounding, and determining medical diagnoses.[55] While this study showed that certain tasks could be reallocated from physicians to PAs, the study had a small sample size and was performed prior to 2013 BIG law amendments. A more recent cross-sectional prospective study looked to compare the tasks and roles of PAs and physicians working in 34 medical wards at 23 Dutch hospitals. Wards with PAs had increased continuity of care. PAs spent a significantly larger portion of their time (41% vs. 20-26%, $p = 0.002$) on direct patient care, which included rounding on the wards, performing medical history and exams, and communicating with patients, compared to the wards with medical residents and medical specialists.[56] Further research is needed on how these differences affect outcomes and the productivity of medical wards in Dutch hospitals.

As PAs become more prominent figures in the health workforce in the Netherlands, additional research is emerging revealing the diversity and utility of the profession. A study on the use of a PA in a general practitioner's (GP) office over two years, showed that while the PA did not reduce the hours worked by a GP, she did increase the access of care as the total number of contacts per 1,000 patients increased by 17%. The PA performed similar clinical tasks as the general practitioner, but treated more acute care cases, younger patients, and saw less chronic and complicated case compared to the general practitioner.[50]

In another study, Ambulance Emergency Medical Services (EMS) performed by PAs were compared to those provided by ambulance registered nurses, who typically perform pre-hospital care in the Netherlands. Two PAs were compared to 23 RNs on a total of 991 EMS runs. The PAs used a medical diagnostic approach with a systematic physical exam, they consulted medical specialists more often (33% vs 17%, $\chi2 = 35.5$, $P < 0.0001$), but referred fewer patients to their primary care doctor (50% vs 73%, $\chi2 = 52.9$, $P < 0.0001$) when compared with the ambulance RNs. While the interventions carried out by PAs and RNs did not differ, the PAs provided 48% of their patients with medical advice while the RNs provided none of their patients with medical advice.[57] Although these studies have small sample sizes and are not very generalizable to PAs throughout the Netherlands, they begin to highlight the versatility of the Dutch PA.

The United Kingdom: Great Britain and Scotland

In the early 2000s, the UK predicted that by 2020, there would be a shortage of about 25,000 doctors.[58] The shortage was predicted to be due to several factors including The European Working Time Directive, which reduced individual doctors working hours and the nation's problems recruiting and retaining healthcare staff. The National Health Service (NHS) decided to look to a new profession to help alleviate the medical workforce shortage.[58,59]

Beginning in April 2003, two US trained PAs were recruited to work in primary care in the West Midlands as part of a pilot study to evaluate the potential use of PAs in the NHS. An additional 12 US PAs joined in 2004 to work in primary care and emergency medicine. Results from the pilot project suggested that PAs integrated well into the primary care workforce; they increased access to primary care services, alleviated the healthcare team workload and "to a great extent, replaced GPs in an under-doctored area". [60] US trained PAs were again involved in another pilot project funded by the NHS, in Scotland between 2006-2008. Twelve PAs worked in four Scottish settings; the ED, primary care, intermediate care and orthopedics. This pilot study was particularly interested in the PA scope of practice, and the impact of PAs on patient care and the healthcare team. In terms of scope of practice regardless of specialty all PAs performed histories, physicals, developed differential diagnoses, ordered diagnostic tests, provided patient education and counseling, and performed injections and basic phlebotomy. The PAs practicing in the ED completed a broader set of tasks both with (intubation, thoracentesis, defibrillation, nasogastric tube insertion, IV sedation, lumbar puncture and joint injections) and without (nasal packing, wound care, incision and drainage, digital nerve blocks) direct physician supervision. The PAs did not have prescriptive privileges. Overall the pilot study revealed that there were no patient safety issues, PAs incorporated well and were considered valuable to the medical team.[61,62]

In 2006, the Department of Health and The Royal College of Physicians developed a report titled "The Competence and Curriculum Framework for the Physician Assistant" (CCF), which lays the groundwork for the role and education standards of a PA in the UK.[52,63,64] Beginning in 2004, the University of Wolverhampton launched the first UK PA program. As of January 2017, there are 27 active PA programs in the UK (Appendix 1), with an additional seven expected to be opening in 2017 and several others developing.[65] In 2009, The UK and Ireland Universities Board for PA Education (UKIUBPAE) was formed, UKIUBPAE worked with the Department of Health to revise the CCF and create standards for PA education programs. All programs are at the postgraduate level and offer either a postgraduate diploma or master's degree.[65] The programs follow the CCF guidelines and span two years of full time studies, typically, with year one focusing on didactics in anatomy, medical sciences and clinical medicine and year two focusing on clinical rotations, however some curriculums link clinical rotations with didactics. Graduates must pass both a 200 question written national examination and a 14 station Objective Structured Clinical Examination (OSCE) in order to practice as a PA. Established PAs are required to complete these benchmarks every 6 years for reaccreditation.[59,64,65] The standard national curriculum, assessment and reaccreditation is shared across the entire UK.

Ritsema and Paterson published data on the first UK census survey in 2011. The census survey found that there were 165 PAs and PA students in the UK at the end of 2010, with PAs practicing in general medicine, emergency medicine and 19 different medical and surgical subspecialties. The most common tasks carried out by PAs included completing medical histories and physical exams, providing patient education, interpreting EKGs, drawing blood and placing IV cannulas and psychiatric assessments.[66] By the end of 2016, there were 350 practicing PAs and an additional 550 PA students in the UK. While the majority of PAs are practicing in general medicine and emergency medicine, PAs are also working in a variety of pediatric, medical and surgical subspecialties.[65] Although the profession is expanding rapidly, it has not yet been given statutory registered status and therefore lacks government regulation over PA roles and privileges. PAs working in the UK do not have prescribing rights and cannot order radiographs. The Faculty of Physician Associates and the Royal College of Physicians are actively lobbying for statutory regulation to politically establish the profession and increase PA privileges.[59,67] In 2013, the profession title was changed from "Physician Assistant" to "Physician Associate" to help reduce confusion with other healthcare professions in the UK.[68]

With PAs practicing in the UK for more than ten years, literature is starting to appear. A qualitative study looked at the motivations of GPs in hiring PAs, and the benefits and challenges of employing PAs. Fifteen GPs from five areas of England were surveyed. Employers stated that PAs were most commonly hired to help improve patient access to care, increase the number of patients seen per day, and affordability. The GPs found that the PAs were able to perform a high volume of work with little supervision but found that the lack of regulatory framework and prescription abilities were barriers.[69] Williams and Ritsema performed a similar qualitative study in 2012 on physician satisfaction with PAs. Sixty-one physicians from a variety of specialties reported that the

PAs provided flexibility, continuity of care and good clinical and communication skills to the medical teams. Eighty-two percent of responding physicians were dissatisfied with the lack of PA prescribing abilities, while 42.6% were upset with the unclear PA role expectations and supervision requirements.[68] Another qualitative study analyzed the job satisfaction among British PAs in 2014. Job satisfaction was assessed using The Cooper 10-item Job Satisfaction Survey, which rates overall job satisfaction from 0-40 (40 = very satisfied). British PAs had a mean satisfaction score of 29.6, median 30 and range 3-40, indicating that they generally satisfied with their career. PA responders were most satisfied with their colleagues and relationships with doctors and least satisfied with their opportunities to use their abilities.[70] The initial qualitative data is supportive of the PA profession in the UK, however no quantitative studies regarding PA use have been published.

Ireland

There is currently limited published peer-reviewed literature on the PA profession or education in Ireland. According to articles in the Irish Medical Times, four PAs from the US were recruited to work at Beaumont Hospital in Dublin Ireland for a two-year pilot program beginning in July 2015 to evaluate the PA role in Ireland. Ireland's Health Service Executive and the Department of Health were interested in creating a PA role in Ireland and helped to support the pilot program.[71,72] The PAs were enlisted to work in surgical specialties including breast, upper and lower gastrointestinal, orthopedics and vascular surgery. The scope of practice of Irish PAs includes completing medical histories and physicals, making a differential diagnosis and devising management plan. Similar to PAs in the UK, they are not able to prescribe medications or order diagnostic tests such as radiology.[71,72] In 2016, the Royal College of Surgeons in Ireland opened a two-year masters PA program with the help of staff in the US and the UK. A cohort of seven students began in January of 2016, which doubled to 14 in January 2017. The students are trained in general medicine with clinical rotations in variety of specialties such as surgery, psychiatry, primary care, obstetrics, pediatrics, and emergency medicine.[71–73]

Germany

Germany has a several rural and remote regions, many located in South and East Germany, which are particularly vulnerable to decreased medical resources. Since the 1990s, there is a trend for German trained doctors to leave and practice overseas. To help mitigate the increasing healthcare demand and short supply of medical providers, Germany established its first PA program in 2005. As of 2013, there were four PA programs in Germany. All four programs are 36 months in length and require nursing vocational training as a prerequisite. Students graduate with a Bachelor of Science degree after completing a bachelor thesis. The first program opened at Steinbeis University Berlin and is accredited by the Accreditation Agency for Study Programs in Health and Social Science. The subsequent programs opened in 2010, 2011 and 2013 at Duale Hoschschule Baden-Württenberg Karlsruhe, Mathias Rheine University of Applied Sciences and Fliedner University, respectively.[74]

As of 2013, there were about 100 PAs working in Germany. Initially, PA training was focused on technical and surgical skills, and thus PAs initially began working in surgical and emergency medicine settings. However, as healthcare demands increased, PAs began working in a wider variety of specialties including cardiothoracic surgery, orthopedics, urology and family medicine. PAs in Germany generally treat patients that are less medically complex than the patients seen by German physicians, German PAs are taught to know their scope of practice and refer to supervising physicians when needed.[74] There is limited published English literature on the PA movement in Germany, and additional English literature is needed to help better understand the current role of a German PA.

Australia

In 2005, Australia began to explore the PA concept as one solution to the increasing demand on the healthcare system.[75,76] Perhaps the biggest barrier Australians face is the geographic misdistribution of healthcare providers. Indigenous populations and those living in rural and remote areas of Australia have insufficient coverage and limited access to primary care.[10,75–77] To evaluate the utility of a PA in the Australian healthcare system, two Australian states, South Australia (SA) and Queensland, initiated pilot projects.

The first pilot project took place in SA beginning in October 2008. Four US trained PAs were recruited by the South Australian Department of Health at four sites; two in the department of surgery at Queen Elizabeth Hospital, one in anesthesia at Royal Adelaide Hospital and one in a pediatric clinic at Flinders Medical Center. The project was designed to assess the PA contribution to the healthcare team, legislative features of implementing PAs, and the fit of the PA role in SA.[78] The PAs completed daily rounds, assisted in surgeries, prescribed medications (based on a formulary list), and participated in outpatient clinics.[76,78,79] One of the surgical PAs worked in a colorectal unit. The addition of the PA allowed the outpatient surgical clinic to add several new clinic days and reduce patient wait times.[76] It was concluded from the pilot that the PA role was a flexible role with a broad medical training that could be transferred throughout the SA health system.[78]

In 2009, Queensland Health recruited five US trained PAs to participate in a 12 month pilot program in four Queensland sites; the Interventional Cardiology Unit of Princess Alexandra Hospital, Cooktown Multi-purpose Health Service, the ED at Mt Isa Hospital and a GP clinic in Normanton. The Queensland pilot had similar objectives to the SA pilot. The tasks PAs performed depended on their clinical setting, but included assessing patients through history and physicals, diagnosing, and treating. The supervising doctors found that by delegating tasks to the PA they had additional free time to care for more complex patients, teach and complete management tasks, which helped improve the system's effectiveness. Overall, the introduction of the PA role improved the quality and safety of medical care. One doctor commented: "The quality of care is almost faultless – very good, very thorough. When I check on what the PA has done it is almost always what I would have done and all the points I would have checked".[80] The pilot highlighted that Australia would have to make several legislative and structural changes to their medical system to appropriately train and license PAs. Although the pilot only utilized a small number of PAs, they were found to be efficient members of the healthcare team to help alleviate growing healthcare demands through task delegation.[80,81]

The University of Queensland established Australia's first PA program in 2009, which awarded a masters degree after two years of study. The program is currently discontinued. In 2012, James Cook University inaugurated its first baccalaureate-level PA program, which currently remains the sole program in Australia. The program is three years in length, two years of didactics followed by one clinical year, students are expected to have at least two years of prior healthcare experience before applying. [52,75] There are now more than 35 Australian trained PAs, many with previous medical backgrounds in paramedics, pharmacy, physiotherapy, radiology and nursing. With a growing number of Australian PAs, the Australian Society of PAs was formed to represent and support the Australian PA movement.[75]

New Zealand

Interest in PAs joining the New Zealand workforce began in the 2000s. New Zealand offers its citizens universal healthcare coverage and is seeking a more financially sustainable health model and to alleviate health provider shortages in the remote and rural areas of the country, where about 25% of New Zealanders live. Also contributing to the poor supply of practitioners is that many New Zealand trained doctors migrate to Australia and other countries.[82,83] A handful of American PAs interested in international PA growth helped begin a series of New Zealand pilot projects. The first, funded by

Health Workforce New Zealand, recruited two US trained surgical PAs to work in acute surgical teams at Middlemore Hospital near Aukland from September 2010-2011.[78,82,83] After the success of the initial project a second project was designed to evaluate the PAs' contribution in broader variety of healthcare settings.

For the second wave of pilot studies, seven US trained PAs were recruited to work in several different healthcare locations; a rural ED in Gore, a small general practice in Tokoroa, two accident and medical clinics in Hamilton (Rotonua Medical Centre and Davies Corner), and two Maori based clinics serving the indigenous population. This pilot took place between December 2013 and February 2015. Overall, PAs had a positive impact; the PAs provided an acceptable level of patient care, fit well into the New Zealand health models and saw a similar number of patient patients per hour as a GP, which allowed the GP to see more complex patients. The biggest integration challenge reported was the PAs' lack of prescribing rights. At the end of the pilot 85% of staff agreed that the PA role would be a "valuable contribution to New Zealand health" and 41% of staff believed PAs would be of most value in general practice.[82] Now having trialed the use of PAs, New Zealand has yet to regulate the profession. Recently, the New Zealand PA Society was formed with hopes to facilitate making the PA a permanent member of the New Zealand healthcare system.[83] There is no literature on whether New Zealand plans to develop their own PA educational program and little is known about the scope of practice of New Zealand PAs.

Israel

Israel is facing a shortage of physicians and has a need for an expanded workforce. In 2010, The Israel Ministry of Health explored the idea of developing a PA role to improve the efficiency of physicians. By August 2012, a PA committee was formed to help launch the new profession. The committee decided to target five specialties with the greatest need for providers and increased efficiency: anesthesiology, emergency medicine, surgery, internal medicine and pathology.[84]

Israel's first PA program launched in May 2016 and was developed to train PAs in emergency medicine. The program is 33 weeks in length and combines didactic, simulation and clinical training. The Israel Ministry of Health recommended introducing the new PA profession by leveraging an existing healthcare profession, paramedics. In the first class, 30 of the 35 students were established paramedics, and the remaining five were foreign trained physicians without authority to practice in Israel. There are plans to start additional PA courses in anesthesiology and pathology.[85]

The government provided financial support to Israeli EDs to hire the new PA students; the students were hired prior to completing the PA education course and then completed all their clinical training in the ED that hired them. The new practicing emergency medicine PAs scope of practice includes performing histories and physicals, phlebotomy, EKGs, and managing ventilators. In collaboration with their supervising physician, PAs develop differential diagnoses, and devise management and treatment plans. Israeli PAs cannot prescribe medications or write nursing orders. As of 2017, foreign trained PAs can apply and work as a PA in Israel.[85]

Saudi Arabia

In 2005, The Kingdom of Saudi Arabia introduced universal health insurance, which provides free healthcare to its citizens and visitors to the country. Saudi Arabia's healthcare providers are largely foreign providers. To help meet the healthcare need the Ministry of Defense and Aviation, Medical Services Division decided to establish a PA program. The goal of the PA profession is to train new health providers to work in military medical field units and other military units.

Beginning in 2008, the Ministry of Defense with the help of the George Washington University Medical Faculty Association began developing a program at the Prince Sultan Military College of Health Science (PSMCHS) in Dhahran. The first class of 19 male Saudis matriculated in September of 2010. There are several rigorous pre-requisites students must meet to be selected for the PA program; they must be a Saudi citizen, under the age of 27, have a bachelors degree in a health science, proficient English reading and writing skills, and commit and complete military training requirements. The program is 28 months in length and results in a Masters degree of applied sciences. The curriculum begins with a four-month transitional semester, followed by a year of didactics, before a final year of clinical clerkships. Students complete clinical clerkships at military and affiliated hospitals in internal medicine, general surgery, emergency medicine, primary care, orthopedics, psychiatry, and tactical/field medicine. After completing the curriculum, students must pass an OSCE and oral examination for certification and licensing. After graduation, the PA completes a six-month emergency medicine internship before serving as a military medical officer in the medical service division of the Ministry of Defense. The PAs are required to devote five years of service to the military. The Ministry of Higher Education has not yet accredited the PSMCHS program and PAs remain an unrecognized profession by the Ministry of Health Specialists. Educational accreditation and profession recognition is needed for PAs to become established members of the Saudi healthcare system.[86,87] Literature beyond the PA education program is scarce; there is currently no English literature on the PA scope of practice or the PAs' role in Saudi Arabia.

India

India does not have a large enough supply of providers to meet demand and exacerbating the problem, Indian trained providers have a tradition of immigrating to western countries. Dr. Cherian, a cardiovascular surgeon, originally introduced the PA profession into India's health workforce in 1987; he saw a need for providers specifically in cardiology. Dr. Cherian began training paramedics to be PAs at the Institute of Cardiovascular Diseases hospital in Chennai. In 1992, he started a formal two-year postgraduate program, which quickly evolved into a four-year Bachelors of Science program at the Birla Institute of Technology and Science. The PAs were primarily trained in and exposed to cardiovascular medicine. As the PA graduates were utilized at the Institute of Cardiovascular Disease hospital, visiting physicians saw the effectiveness of the PA role and the profession began to spread.[88,89]

Beginning in 2004, the PA profession and educational programs broadened beyond cardiovascular surgery and started expanding within the healthcare system. There are currently 47 institutes in collaboration with 10 universities that have PA programs in India.[89] The PA education programs are not uniform some offer graduates a bachelors degree, while others a postgraduate diploma or masters degree. Although there is no standardized curriculum, the majority are based on a medical model and provide a generalist training. In addition to classroom and clinical education training, programs offer classes on technical report writing, statistics, and research.[88]

PAs in India can be found working in internal medicine, general surgery, orthopedics, obstetrics and gynecology, oncology, intensive care units and emergency medicine. In both inpatient and outpatient medical specialties, PAs take histories, order and interpret diagnostic tests, educate patient on disease conditions and preventative medicine, provide continuity of care and initiate treatments. Since the profession began in a surgical specialty, surgery remains popular among practicing PAs in India. Surgical PAs work as first or second assistants, harvest veins for coronary bypass surgery, complete operation notes and monitor patients post-op. Outside of the medical field, PAs are also hired by healthcare information, healthcare insurance and medical device companies.[88,89] As of 2014, there were about 1,300 PAs and 1,200 PA students in India. However, the Indian government has not yet recognized the expansion and the profession is not licensed.[89]

South Africa

PA-like providers, or "non-physician clinicians" have been used in a wide range of African countries for more than a century. These practitioners generally practice primary care in rural settings, they often act independently and are seen as physician substitutes.[15,90] In 2002, South Africa decided to introduce a new mid-level medical provider, titled the Clinical Associate. South Africa is currently in the process of establishing universal health coverage for its citizens, which would include coverage for the rural and underserved populations. About 80% of South Africa's population receives healthcare from the South African public healthcare service, where primary care is primarily provided by nurse practitioners and supported by physicians. Very few physicians can support primary care health when they spend the majority of their time working in the district hospitals. The Clinical Associate role was designed to prepare graduates to work along side physicians in the district hospitals, while freeing up more physician time to focus on primary care.[90–93]

The Family Medicine Education Consortium was tasked with establishing a core curriculum and educational standards based on the common conditions seen and common tasks performed in district hospitals. In 2008, Walter Sisulu University in the Eastern Cape matriculated the first 23 students. The following year, the University of Wiwatersrand in Johannesburg and the University of Pretoria opened Clinical Associate programs. The programs seek to recruit a wide variety of students, particularly those from remote, rural and disadvantaged areas. All three programs are offered at medical schools, are 3-years in length and students graduate with a Bachelors of Clinical Medical Practice degree. The curriculum focuses on case-based learning in small groups and provides early clinical experiences at district hospitals. After program completion, graduates are registered with the Medical and Dental Professions Board of the Health Professions Council of South Africa. By the end of 2013, there were 397 graduated clinical associates, most of whom are now working in district hospitals, largely in rural locations.[90,91,93] It was estimated that there is a need for 1,350 Clinical Associates to meet a target of five clinical associates per district hospital. Additionally, two of the three schools are also now developing post-graduate programs to offer further specialized training for the clinical associate graduates, in fields such as emergency medicine, orthopedics and infectious disease.[90]

The Clinical Associate profession was designed to work closely with physicians while working under their supervision. They are trained with generalist skills and a focus on primary care. Clinical Associates help perform emergency care, complete medical rounds, carry out diagnostic and therapeutic procedures, perform physical exams and counsel patients; however, Clinical Associates do not currently have prescribing privileges. There is no literature on the impact or efficacy of clinical associates in practice, but anecdotal accounts find that they are a positive contribution to the healthcare team. As the number of clinical associates grows, they are expected to expand beyond district hospitals to rural health centers, regional hospitals and private practices. The profession still has several challenges to overcome such as providing adequate physician supervision in rural settings, the need for additional training sites and government regulation issues like prescribing rights.[90,92,93] To address some of these issues the Professional Association of Clinical Associates in South Africa (PACASA) was created in September 2012. PACASA recently began working with the Rural Doctors Association of Southern Africa with hopes that clinical associates become an essential part of rural healthcare.[90,91]

Table 1. PA Educational Programs by Country

Country	Year first PA program opened	# of PA programs	Length	Degree Awarded	Curriculum Comments
United States	1965	218	Varies. 21-36 months	Typically Masters, 5 Bachelor Programs	Varies. Typically 1 year didactic followed by 1-1.5 years clinical
Canada	1984	4	24-26 months	3 Bachelors, 1 Masters	1 military program, 3 civilian programs
The Netherlands	2001	5	30 months	Masters	Didactic and Clinical education combined
The United Kingdom	2004	27	24 months	Masters or Postgraduate diploma	Varies, come link clinical rotations with didactics
Ireland	2015	1	24 months	Masters	1 year didactic, 1 year clinical
Germany	2005	4	36 months	Bachelors	Entering students have a nursing background
Australia	2009	1	36 months	Bachelors	2 years didactics, 1 clinical year
New Zealand	None				does not currently have its own PA program
Israel	2016	1	9 months	Certificate	Emergency Medicine only
Saudi Arabia	2008	1	28 months	Masters	4 month transitional period, 1 year didactics, 1 year clinical
India	1992	47	24-36 months	Bachelors, Postgraduate diploma, Masters	No standard curriculum
South Africa	2008	3	36 months	Bachelors	Students train with medical students, early clinical exposure

Table 2. PA Scope of Practice by Country

	Perform History and Physicals	Diagnose and Treat	Education and Counseling	Order and Interpret Diagnostic tests	First Assist in Surgery	Perform Basic Medical Procedures	Prescribe Medications
United States	√	√	√	√	√	√	√
Canada	√	√	√	√	√	?	≈
The Netherlands	√	√	√	√	√	√	√
The United Kingdom	√	√	√	≈	?	√	-
Ireland	√	√	√	≈	?	?	-
Germany	?	?	?	?	?	?	?
Australia	√	√	√	√	√	?	≈
New Zealand	?	?	?	?	?	?	?
Israel	√	≈	√	≈	-	-	-
Saudi Arabia	?	?	?	?	?	?	?
India	√	√	√	√	√	?	?
South Africa	√	√	√	√	?	?	-

"√" = PAs can perform the task
"≈" = PAs are limited in the task
"–" = PAs are not allowed to perform the task
"?" = Unknown (no English literature related to the task)

METHODS

Study design

This mixed-methods study will use semi-structured interviews to investigate the current scope of practice and tasks of PAs in each foreign country. Additionally, the study will shed light on each country's motivation behind developing a PA-like profession as well as ongoing barriers and challenges. Qualitative and quantitative data will be analyzed to elucidate shared themes, commonalities and differences among international PA practices.

Study population and sampling

All countries with an established or developing PA profession that meets inclusion criteria will be asked to participate in the study. Currently, there are 12 countries that fulfill the inclusion criteria; Australia, Canada, Germany, Great Britain, India, Israel, Ireland, New Zealand, Saudi Arabia, Scotland, South Africa, and The Netherlands.

Inclusion Criteria:

- The country has a new PA profession or PA equivalent profession that has been developed or developing within the last 17 years.
- The PA-like provider is trained using a condensed medical education model.
- The country has English speaking contacts.

Intervention

The intervention is designed to better understand the rationale behind the PA profession development, the current scope of practice and barriers to PA providers in each country. The information will be obtained through focused semi-structured interviews. Each eligible country will complete the following open-ended ten-question survey.

I. Rationale for the introduction of PAs
    1. What were the healthcare needs that led to the PA profession being developed in your country?
    2. How many PAs are practicing?

II. PAs roles, tasks and scope of practice
    1. What medical and surgical fields are PAs currently practicing in?
        a. Which are the most common?
    2. Describe the roles PAs have in
        a. Completing patient history and physical exams?
        b. Diagnosing patients
        c. Treating patients
    3. Describe the patient education and counseling that PAs provide.
    4. Describe the roles of PAs in surgical specialties
        a. First assist?
    5. What basic medical procedures can PAs perform?

a. See appendix 2

6. Can PAs prescribe medications?

    a. If yes, are there restrictions?

III. Future directions, barriers, and challenges

1. What are the future directions for the PA profession?
2. Are there current barriers to overcome?

Recruitment

At least one primary English speaking contact from each country will be recruited to complete the interview questionnaire. The primary contact will be recruited using email communication. Emails of contacts will be acquired through networking with US PAs that are currently involved in developing the PA profession outside the US. Contacts will also be found by connecting with authors from select literature sources found in the literature review section. Additionally, investigators will reach out to country specific PA professional organizations (Canadian Association of PAs, NAPA, The Faculty of Physician Associates, Australian Society of PAs, New Zealand PA Society, PACASA), government health organizations such as the ministry of health and PA education program founders. Contacts will include current US PAs and doctors who have helped develop an international PA profession, practicing international PAs and international doctors who have supervised or worked closely with PAs.

Data collection

Informed consent will be obtained from each interviewed participant. The questionnaire will primarily be completed through telephone and Skype interviews. Telephone and Skype interviews will be audio recorded and then transcribed to a word document. If telephone or Skype communication is not available, the questionnaire will be sent and completed via email. One investigator will complete all of the initial interviews to maintain interviewer consistency. To reach a broader network, the investigator will ask each of the initial participants for names and email addresses of any additional individuals involved in the PA profession development in their country. The ten-question survey will then be emailed to all of the additional contacts obtained.

Data analysis

The compiled qualitative interviews will be assessed for similarities and differences among countries. The data will be analyzed to identify unifying themes including the most common motivations for establishing a PA profession and the most common barriers to PAs based on grounded theory analysis using QRS NVivo 11 Software (QRS International Pty Ltd. Version 11, 2015). Using grounded theory, the more meaningful and pervasive interview responses and concepts will emerge throughout the data collection. The scope of practice of PAs in each country will be assembled in a table (table 3). The information in table 3 will be used to compare the frequencies of tasks performed by PAs in each country and the proportion of countries that can complete each task. Each country will be compared and ranked in terms of variety in fields of practice and breadth in scope of practice. The data will be assessed for correlations between the depth of the PAs scope of practice and the following: the number of practicing PAs, years the PA profession has been established, the number of fields PAs practice in, and the healthcare needs of the country. From the data, investigators will be able to compile a set of tasks and roles that all PAs share globally.

Table 3. Study PA Scope of Practice by Country

	Perform History and Physicals	**Diagnose and Treat**	**Education and Counseling**	**Order and Interpret Diagnostic tests**	**First Assist in Surgery**	**Perform Basic Medical Procedures**	**Prescribe Medications**
Countries 1-12							

Timeline and resources

Table 4. Proposed Study Timeline

Summer 2017	September 2017	October 2017	November 2017	December 2017	January 2017	February 2017
• IRB Submission and Approval	• Recruit and Identify primary Contacts	• Perform Interviews • Transcribe Interviews			• Data Analysis • Conclusions	

Two investigators will complete the study. The co-investigators will both recruit the primary contact for each country and complete the data analysis. One investigator will perform all telephone and Skype interviews and transcribe all interview, the other investigator will review all of the collected interviews and transcribed data to agree on common themes.

Institutional Review Board

The study protocol involves collection of data on group characteristics though an interview questionnaire, which meets 45 CFR 46.110 criteria to qualify for expedited Institutional Review Board (IRB) review. Therefore, the study protocol will be submitted to the IRB for expedited review.

CONCLUSION

Discussion

In 2017, the US PA profession celebrated its 50^{th} birthday. For the past 50 years, the profession has been expanding and flourishing into a vital member of the healthcare workforce in the US. Within the past 17 years, several countries have turned to the PA role to help meet healthcare needs. This study aims to reveal why individual countries are developing a PA profession and what it means to be a PA in each country. The results will clarify what tasks within the PA scope of practice are shared among each country.

There are several limitations in the current literature on the global PA movement and in this study. The literature review of each country is a compilation of the available research published in English. Most countries with a new PA profession only have a handful of published papers, which are mostly composed of outcomes from pilot PA studies and descriptive results from qualitative studies. The studies have small sample sizes and provide data on only a modest number of practicing PAs. Similar to the existing research, this study will only have a small sample size, as there are only twelve countries that currently meet the inclusion criteria. The proposed qualitative study will provide insight on unifying themes and commonalities among the PAs in each country, but will not provide quantitative data on the current efficacy of PAs in the healthcare workforce. The available research on PAs in several countries, such as Germany and Israel, is restricted due to lack of English language sources. One anticipated challenge in the study is being able to connect with an English speaking contact from each country. For the study to provide adequate data, the study must have at least one contact from each country that is willing and able to provide sufficient detailed information to complete the interview questionnaire.

While the study will have limitations, it will also be the first study to compile and compare data from all of the countries with a new or developing PA profession. By interviewing contacts involved in PA development in each country, this study will be able to identify and connect a network of individuals with similar goals. The anticipated results of this study will help to better understand the motivations for starting a PA profession in each country. The data will highlight the shared training, scope of practice and tasks that define all PAs.

Summary

Among the twelve countries with new and emerging PA professions, there are several unifying themes. Overall, PA professions have been introduced globally as a means of improving healthcare access and helping to alleviate the healthcare workforce shortage. With rises in chronic diseases, aging populations and further specialization of medicine, countries began to look to a new source of medical talent. The majority of the twelve countries are developed countries where healthcare services are poorly distributed, leaving rural and remote areas without adequate access. While some countries needs were greatest in particular medical and surgical subspecialties, most turned to PAs due to shortages of primary care providers.

Globally, there are several consistencies in the establishments and educational systems that train PAs. Similar to the US, the programs in Canada and Saudi Arabia were originally developed by the military. Every country with an established PA program, trains PAs using a condensed medical education and largely recruit students with a few years of prior medical experience. Generally, curriculums are between 24-36 months in length and consist of a year of didactic studies followed by clinical rotations. However, some countries such as the Netherlands, Israel and South Africa integrate clinical work throughout the curriculum. While the US has the largest number of PA programs, it also has significant variability in training length and level of degree awarded. Many of the countries that have recently designed educational programs have standardized the curriculum, length of study and degree.

Although the training of PAs is relatively consistent, the title of the profession is not; most countries use PA, but physician associate and clinical associate are also used. PAs are being educated and deployed in countries in a wide range of medical and surgical specialties. While some countries such as India, Israel and Ireland introduced the PA to work in a specific specialty based on need, other countries like the Netherlands, the UK and Canada integrated PAs into numerous medical and surgical specialties. In all countries, PAs work under the supervision of a physician, however their scope of practice is highly variable. Common among all PAs is the ability to perform patient histories and physicals, diagnose and educate patients. However, acting as a first assistant in surgery, prescribing medications and performing procedures is not universal. This study will help to fill the current gap in literature on the PA scope of practice, roles and tasks in many of the twelve countries.

Clinical and/or public health significance

This study aims to explore the global expansion of the PA profession, while uncovering motivations, roles, tasks and barriers shared by PAs in each country. The qualitative data will be compiled in one comprehensive source that can be used to connect the countries that are currently developing PA professions and spark interest in additional countries with gaps in their healthcare systems. The results of this study can help direct future research on the global PA movement. By providing more information of the global expansion of PAs, this study can help to illuminate and mobilize an emerging profession that is playing an important role in seeking to alleviate the global healthcare workforce shortage.

APPENDIX 1

PA Programs in the United Kingdom

Universities with PA Program		
Aberdeen	East Anglia	Sheffield Hallman
Anglia Ruskin	Hull and York Medical School	Sheffield Medical School
Bongor	Leeds	St. George's of London
Birmington	Liverpool	Surrey
Bradford	Manchester	Swansea
Bright and Sussex Medical School	Newcastle	Ulster
Brunel	Plymouth	West of England
Canterbury Christchurch	Queen Mary	Wolverhampton
University of Central Lancashire	Reading	Worcester

APPENDIX 2

Basic Medical Procedures List

Procedure	PA is able to perform?
Advanced Cardiac Life Support	
Arterial Line Access or Arterial Blood Gas	
Central Line Insertion	
Chest Tube Insertion	
Fracture or Dislocation Reduction	
Gynecologic/Genitourinary Cultures or Pap Smear	
Intubation-Endotracheal	
Irrigation and Drainage of Abscess	
Joint Arthrocentesis/Injection	
Local Anesthesia	
Lumbar Puncture	
Nasogastric Tube Intubation	
Paracentesis	
Splint or Cast Placement	
Thoracentesis	
Ultrasound-Abdominal, Knee, Neck Veins, Pelvis, Thoracic Cavity	
Vaginal Delivery	
Wound Care- Sutures or Staples	

LIST OF JOURNAL ABBREVIATIONS

Am J Manag Care	American Journal of Managed Care
Am J Med Qual	American Journal of Medical Quality
Ann Fam Med	The Annals of Family Medicine
ANZ J Surg	Australia and New Zealand Journal of Surgery
Aust J Rural Health	Australian Journal of Rural Health
BMC Health Serv Res	BioMed Central Health Services Research
Bull World Health Organ	Bulletin of the World Health Organization
Can Fam Physician	Canadian Family Physician
Can J Emerg Med	Canadian Journal of Emergency Medicine
Can J Surg	Canadian Journal of Surgery
Clin Med	Clinical Medicine
Crit Care Med	Critical Care Medicine
Emerg Med Australas	Emergency Medicine Australasia
Glob Health Action	Global Health Action
Health Policy Plan	Health Policy and Planning
Hum Resour Health	Human Resources for Health
Intensive Care Cardiovasc Anesth	Intensive Care & Cardiovascular Anesthesia
J Adv Nurs	Journal of Advanced Nursing
JAMA	The Journal of the American Medical Association

J Am Acad Physician Assist	Journal of the American Academy of Physician Assistants
J Am Acad Nurse Pract	Journal of the American Academy of Nurse Practitioners
J Am Coll Surg	Journal of the American College of Surgeons
J Eval Clin Pract	Journal of Evaluation in Clinical Practice
J Health Serv Res Policy	Journal of Health Services Research and Policy
J Hosp Med	Journal of Hospital Medicine
J Physician Assist Educ	Journal of Physician Assistant Education
Med J Aust	Medical Journal of Australia
N Engl J Med	New England Journal of Medicine
Rural Remote Health	Rural and Remote Health
S Afr Med J	South African Medical Journal
Scand J Trauma Resusc Emerg Med	Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine
Scott Med J	Scottish Medical Journal
World Health Popul	World Health and Population

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