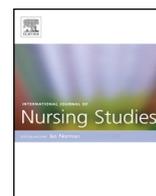




ELSEVIER

Contents lists available at ScienceDirect

International Journal of Nursing Studies

journal homepage: www.elsevier.com/ijns

Skill mix, roles and remuneration in the primary care workforce: Who are the healthcare professionals in the primary care teams across the world?



Tobias Freund^{a,*}, Christine Everett^b, Peter Griffiths^c, Catherine Hudon^d,
Lucio Naccarella^e, Miranda Laurant^{f,g}

^a Department of General Practice and Health Services Research, University Hospital Heidelberg, Germany

^b Health Innovation Program, University of Wisconsin-Madison, United States

^c National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care (Wessex) and University of Southampton Centre of Innovation and Leadership in Health Sciences, United Kingdom

^d Department of Family Medicine and Emergency Medicine, Université de Sherbrooke, Québec, Canada

^e The Australian Health Workforce Institute, Melbourne School of Population and Global Health, The University of Melbourne, Australia

^f Scientific Institute for Quality of Healthcare (IQ healthcare), Radboud University Nijmegen Medical Centre and Knowledge Centre of Sustainable Healthcare, Nijmegen, The Netherlands

^g HAN University of Applied Sciences, Nijmegen, The Netherlands

ARTICLE INFO

Article history:

Received 16 October 2013

Received in revised form 10 November 2014

Accepted 27 November 2014

Keywords:

Primary health care

Workforce

Skill mix

Review

Nurses

Nurse practitioners

ABSTRACT

World-wide, shortages of primary care physicians and an increased demand for services have provided the impetus for delivering team-based primary care. The diversity of the primary care workforce is increasing to include a wider range of health professionals such as nurse practitioners, registered nurses and other clinical staff members. Although this development is observed internationally, skill mix in the primary care team and the speed of progress to deliver team-based care differs across countries. This work aims to provide an overview of education, tasks and remuneration of nurses and other primary care team members in six OECD countries.

Based on a framework of team organization across the care continuum, six national experts compare skill-mix, education and training, tasks and remuneration of health professionals within primary care teams in the United States, Canada, Australia, England, Germany and the Netherlands. Nurses are the main non-physician health professional working along with doctors in most countries although types and roles in primary care vary considerably between countries. However, the number of allied health professionals and support workers, such as medical assistants, working in primary care is increasing. Shifting from 'task delegation' to 'team care' is a global trend but limited by traditional role concepts, legal frameworks and reimbursement schemes. In general, remuneration follows the complexity of medical tasks taken over by each profession.

Clear definitions of each team-member's role may facilitate optimally shared responsibility for patient care within primary care teams. Skill mix changes in primary care may help to maintain access to primary care and quality of care delivery. Learning from experiences in other countries may inspire policy makers and researchers to work on efficient and effective teams care models worldwide.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

* Corresponding author at: Department of General Practice and Health Services Research, University Hospital Heidelberg, Voßstrasse 2, 69115 Heidelberg, Germany. Tel.: +49 6221 56 39160.

E-mail address: tobias.freund@med.uni-heidelberg.de (T. Freund).

What is already known about the topic?

- Internationally, primary care is delivered by teams of physicians and healthcare professionals.
- Significant differences regarding education, tasks, remuneration and terminology of health professionals in primary care can be observed internationally.

What this paper adds

- Nurses are the major non-physician workforce in primary care teams in the US, Canada, Australia, UK and the Netherlands.
- In general, remuneration follows complexity of tasks in most countries under study.
- “Team-care” rather than “delegation” is an upcoming trend as well as integration of “allied health professionals” under the supervision of doctors and nurses, but this is often limited by local legislation and traditional role concepts.

1. Background

Primary care systems across the world face the challenge of decreasing medical workforce in tandem with increasing care demands. On the supply side, the numbers of medical graduates entering primary care specialties such as general internal medicine, family medicine or geriatrics are decreasing in the United States (US) (Swartz, 2012) and internationally (OECD, 2012). On the demand side, numbers of patients (Hofer et al., 2011; Petterson et al., 2012) as well as care demands (Tinetti et al., 2012) are substantially increasing. In some countries changes to health systems also increase demand. For example, in the US, the Patient Protection and Affordable Care Act of 2010 expanded insurance coverage to millions of uninsured individuals by the year 2014 thereby further increasing the demand for primary care (Hofer et al., 2011). In the face of these developments, the traditional concept of the ‘lone-doctor-with-helpers model’ may induce substantial problems with access to primary care (Ghorob and Bodenheimer, 2012).

In response to these problems, the diversity of the primary care workforce is expanding to include non-physician health professionals such as nurse practitioners, registered nurses and other clinical staff members (Green et al., 2013). Although this development can be observed internationally, the skill mix in the primary care workforce as well as speed of progress to deliver primary care as a team differs across countries (Buchan and Dal Poz, 2002; Richards et al., 2000; Sibbald et al., 2004). This paper aims to discuss skill-mix, education and training, tasks and remuneration of health professionals within primary care teams in the United States, Canada, Australia, England, Germany and the Netherlands. We characterize and compare health professionals and provide insight into global trends in changing skill mix of the primary care workforce.

1.1. Classification of health professionals

Differences in terms and names describing non-physician health professionals in different countries hinder

international comparison. Therefore, in this paper health professionals are classified by the care continuum framework proposed by Kernick (1999). This scheme divides health professionals into five distinct areas of care delivery according to complexity of tasks and resource allocation ranging from full management of all clinical cases (Area A = general practitioner) to simple well-defined tasks like urine analysis or phlebotomy (Area E = nursing aide/assistant).

In this article, skill mix in the primary care workforce of six countries is discussed by a team of national experts; each country is represented by one expert (i.e., the authors). We include the US, Canada, Australia, England, Germany and the Netherlands as publications from these six countries cover over 80% of the literature on primary care skill mix and workforce (as determined by a MEDLINE search on May 10, 2013 by using the keywords “primary care”, “workforce” and “skill mix”) Each national expert (i.e., author) decided on the position of the providers on Kernick’s continuum. By means of this framework, non-physician health professionals in primary care can be compared and matched with each other across countries, although we acknowledge that this framework is limited by its focus on medical tasks. Characterization of the workforce and issues for each country was informed by scientific publications, policy reports of local authorities (including websites) and supplied by personal communication if further information was needed (referenced at the end of each table).

Skill mix of the primary care workforce is characterized as follows: Original titles/roles of members of primary care teams in all countries are provided in local language. This may enable international readers to map from titles/roles of local health professionals to similar roles in other countries. The ‘Basic education’ required to enter professional training includes minimum years of primary and secondary school. ‘Professional education’ refers to basic training which is required for becoming a specific health professional with ‘special training’ referring to mandatory or optional training prior to working in primary care practice. We report on the licensing for each health profession extended by information on the accreditation of specialty training (if applicable). Common medical work performed by each health professional is displayed according to either legal frameworks, official statements or common practice where legal frameworks or official statements do not exist. We inform about the existence of professional organizations for each health profession and whether membership is mandatory for those practicing in primary care. Finally, information about average annual salary is given in US dollars by converting local currency into US dollars by averaged exchange rates for the year 2012 (Interbank, 2013).

2. The national perspective: primary care workforce in six countries

2.1. United States

A constellation of social and political factors have set the stage for team-based primary care in the US. With the

aging of the population and the mandated expansion of insurance coverage specified in the Affordable Care Act, demand for services is expected to increase significantly. Combined with a shrinking number of medical trainees planning for careers in primary care, a significant shortage of primary care physicians is predicted by 2025 (Swartz, 2012). This mismatch between demand and supply, as well as new policy initiatives focused on improving access and quality while reducing cost, has increased the interest in team-based primary care practice redesign (Margolius and Bodenheimer, 2010).

Currently skill mix in primary care includes a number of different non-physician health professionals summarized in Table 1. While there appears to be general agreement that transformation to multidisciplinary teams is necessary, the approaches to implementing primary care teams are highly varied (Bodenheimer and Laing, 2007; Nelson et al., 2010; Smith et al., 2010). The factors associated with this variation have not been studied, but are likely due to a variety of local factors, including differences in state scope of practice laws. Some approaches utilize traditional primary care health professionals but redefine or extend their roles. For example, some models refocus the roles of medical assistants to completing additional tasks such as ordering routine tests and supporting patient self-management (Bodenheimer and Laing, 2007; Nelson et al., 2010). Other models include healthcare professionals not traditionally utilized in primary care, including social workers, pharmacists (Smith et al., 2010), or community health workers, and expand the expertise within the primary care team. In each example, the goals include efficient utilization of all providers (i.e., “working to the top of the license”) and improving the quality of care. The comparative effectiveness and the extent to which multidisciplinary teams have been implemented are currently unknown.

2.2. Canada

Until the last decade, primary healthcare services in Canada were delivered mainly by family physicians and general medical practitioners. Numerous studies of the health care system have emphasized the importance of primary healthcare reform (Health Canada, 2012).

In 2000, an Action Plan for Health System Renewal was adopted with increased investments to primary healthcare delivery so that “Canadians receive the most appropriate care, by the most appropriate providers, in the most appropriate settings” (Canadian Intergovernmental Conference Secretariat, 2000). The 2002 Romanow report discussed the need for an overhauled approach to primary healthcare, calling for comprehensive 24 h a day, 7 days a week on-call care, interprofessional health care teams, and more emphasis on health promotion (Romanow, 2002). Romanow suggested that basic guidelines for improvement in the delivery of primary healthcare would allow provinces to each develop a unique approach. In 2004, the federal government and all provinces and territories (Québec agreed to the overall objectives but committed to developing its own plan) committed to ensuring that 50% of Canadians have access to multidisciplinary teams in primary healthcare by 2011.

All provinces and territories had designed models of care and multidisciplinary teams with innovative approaches. For example, in British Columbia, interprofessional care networks were developed for patients with chronic health conditions. The Divisions of Family Practice were created, through which groups of primary care physicians could address gaps in patient care and promote family medicine. On the other side of the country, Newfoundland and Labrador divided the province into 30 team areas to serve the entire population. The Ontario government has also developed new approaches to primary healthcare, such as the family health team (184 in 2012) (Ministry of Health and Long-term Care Canada, 2012). A unique feature of family health teams is their emphasis on interprofessional care. A Family Health Team provides ongoing health care through a team of primary care physicians, registered nurses and other health care providers like dietitians and social workers (Donald et al., 2010). In Quebec, the Family Medicine Groups (250 in 2012) play a similar role.

Table 2 displays skill mix of the primary care workforce in Canada. However, the implementation of multidisciplinary teams across Canada is unequal. Presently, relatively few Canadians access primary healthcare services in this way. Although there has been considerable progress made in integrating nurse practitioners into the healthcare system and there is mounting evidence to support the value of the role, there is more to do to fully integrate and sustain the role (Donald et al., 2010).

2.3. Australia

Primary care is still the cornerstone of the Australian health care system but the delivery of care and business side has been changing due to changing workforce dynamics (Australian Medical Workforce Advisory Committee, 2005). General practices run as private businesses in Australia. The primary care landscape is changing in Australia. There is a shift away from medically qualified general practitioners working as solo practitioners providing episodic opportunistic care, one way referral processes and fee-for-service financing only. General practices now tend to have two to five primary care physicians and provide a greater focus on prevention and early intervention, structured chronic disease management, within multidisciplinary care team approaches. General practice clinic ownership is becoming concentrated into fewer hands, due to the emergence of corporate ownership and the rise of the ‘GP super clinics’ (Naccarella et al., 2012).

Table 3 provides a snapshot of the current workforce composition and skill mix within Australian primary healthcare. Currently, the composition and skills mix within primary care is changing. The 2012 Australia Medicare Local Alliance National survey reports that the number of registered nurses working in general practice is continually increasing. The percentage of practices employing a registered nurse has also increased; as is the number of registered nurses per practice (Australian Medicare Local Alliance, 2012). Over the past decade, the Australian Commonwealth Government has introduced Enhanced Primary Care Chronic Disease Management

Table 1a
Primary care workforce of the United States of America.

United States of America 313.9 Mio population	Area A (general practitioner)	Area B (nurse practitioner/physician assistant)	Area C (extended role practice nurse)	Area D (practice nurse)	Area E (practice nurse auxiliary)
Original Name	Primary care physician	Nurse practitioner or physician assistant	Clinical Nurse Specialist (CNS) and Certified Nurse-Midwives (CNM)	Registered nurse	Licensed practical nurse or medical assistant
Total number	Internal medicine: 109,048 ^a Family medicine: 106,549 ^a Pediatrics: 5509 ^a Internal medicine/peds: 3844 ^a	Total NP = 155,000 in 2010; 105,400 in primary care ^c Total PA = 83,466 in 2010; Estimated 25,874 in primary care ^d	Not available for primary care only (total CNS = 69,000) ^g (total CNM = 13,071) ^h	Not available for primary care only (total = 2,737,400) ^b	LPN: not available for primary care only (total = 752,300) ^b CMA: not available for primary care only (total = 527,600) ^b
% Practices employing	There are some NP-only clinics, but there is no single source of information on this and would be difficult to estimate	Not available for primary care only. Approximately 49% of physicians in outpatient settings work with PA/NPs. ^e 60% of family medicine physicians report working with PAs, NPs or Midwives ^f	Not available	Not available	Not available
Years of basic education	4 (undergraduate degree)	NP: 4 year undergraduate, usually Bachelors in Nursing to achieve RN PA: 4 year undergraduate degree with necessary prerequisites	4 years (undergraduate degree)	All education is professional (see professional education)	All education is professional (see professional education)
Professional education	Med school 4 years Internship: 1 year Residency: 3 years	NP: Registered Nurse (3 years) + years full-time (or part-time equivalent Previously Masters program, now Doctorate: 2–3 years PA: Masters degree: 2–3 years	Registered Nurse + Masters or Doctorate in specialized area of nursing (2–4 years)	Bachelor's, associates or diploma programs (2–4 years of education) Masters degree for nurse administrators, educators, or leaders	LPN: accredited 1 year certificate program MA: certificate program or experience such as military training
Licensing	State medical boards	PA: State Medical Board; need to pass National Certification Exam – two exams (adult only or adult plus pediatric) NP: State Nursing Board; need to pass National Certification exams – different exams for different specialties	State Nursing Board; need to pass national certification exams for some specialties) ^h	State Board of Nursing	LPN: State Board of Nursing – need to pass National Council Licensure Examination MA: There is no licensing for MAs, however, some states require tests before certain duties can be performed (e.g., X-rays)
Special training	Board Certification required for each specialty. Qualify for test when complete residency	PA: Some post-graduate fellowships, but none required NP: Piloting NP fellowships	Training is limited in scope to area of specialty Can include such services as prenatal services, transitional care, chronic disease management, and mental health	Not applicable	Not applicable
Accreditation of special training	Board Certification of each specialty: American Board of Internal Medicine; American Board of Family Medicine; American Board of Pediatrics	Not applicable	Certification by exam in some specialties, but not all. May need to be certified by state licensing board	Not applicable	Not applicable

Medical tasks	Examination, clinical diagnosis and treatment of all presentations Coordination of care delivered in all healthcare settings	NP: Nursing functions plus examination, diagnosis and treatment of patients plus coordination of care delivered in all healthcare settings PA: examination, diagnosis and treatment of patients plus coordination of care delivered in all healthcare settings	Depends on specialty, but involves diagnosis and treatment of diseases, injuries and/or disabilities within field of expertise	Coordinate patient care, educate patients and the public, provide advice and emotional support to patients and families, preventive activities (e.g., immunizations); expanded roles include delivery of algorithm-based care such as medication adjustment for non-complex patients with chronic illness Not applicable	LPN: operate under direction of RN and doctors. Perform basic nursing functions MA: Duties vary. Perform administrative and clinical procedures, such as collecting patient history and collecting vitals (pulse, respirations, temperature)
Professional organization	American College of Physicians; American Academy of Family Physicians; American Academy of Pediatrics	There are many, but a few include: American Association of Nurse practitioners; American Academy of Nurse Practitioners, American Academy of Physician Assistants, National Commission on Certification of Physician Assistants	National Association of Clinical Nurse Specialists		LPN: National Federation of Licensed Practical Nurses; National Association for Practical Nurse Education and Service MA: American Association of Medical Assistants; American Medical Technologists
Salary per year (USD)	Internal medicine: 191,520 ^b Family practice: 180,850 ^b Pediatrics: 167,640 ^b	PA: 92,460 ^b (not primary care specific) NP: 91,450 ^b (not primary care specific)	50,800–100,000 ^g (not primary care specific)	67,930 ^b (not primary care specific)	LPN: 42,400 ^b MA: 30,550 ^b (not primary care specific)

Data sources:

^a Center for Workforce Studies, Association of American Medical Colleges, 2012. Physician Specialty Data Book. November 2012. https://members.aamc.org/eweb/DynamicPage.aspx?Action=Add&ObjectKeyFrom=1A83491A-9853-4C87-86A4-F7D95601C2E2&WebCode=PubDetailAdd&DoNotSave=yes&ParentObject=CentralizedOrderEntry&ParentDataObject=Invoice%20Detail&ivd_formkey=69202792-63d7-4ba2-bf4e-a0da41270555&ivd_prc_prd_key=C7F68470-F2D7-45AA-BC1D-DB67C3F2D318 (accessed 10.05.13).

^b May 2012 National Occupational Employment and Wage Estimates, Bureau of Labor Statistics: http://www.bls.gov/oes/current/oes_nat.htm#29-0000 (accessed 10.05.13).

^c American Academy of Nurse Practitioners. Nurse Practitioners Facts. <http://www.aanp.org/all-about-nps/np-fact-sheet> (accessed 10.05.13).

^d American Academy of Physician Assistants. Physician Assistant Census Report: Results from the 2010 AAPA Census. www.aapa.org (accessed 12.01.13).

^e Park, M., Cherry, D., Decker, S.L. Nurse Practitioners, certified Nurse Midwives, and Physician Assistants in Physician Offices. NCHS Data Brief No. 69, August 2011.

^f Peterson, L.E. Most family physicians work routinely with nurse practitioners, physician assistants, or certified nurse midwives. JABFM 26(3), May–June 2013.

^g Clinical Nurse Specialist: http://explorehealthcareers.org/en/Career/82/Clinical_Nurse_Specialist.

^h Certified Nurse-Midwife: “Essential Facts about Midwives” American College of Nurse-Midwives. <http://www.midwife.org/Essential-Facts-about-Midwives>, June 2014.

Table 1b
Additional Primary Care Team Members in the United States of America.

United States	Area F (social worker)	Area G (pharmacist)	Area H (community health workers)
Original Name	Social worker		
Total number	Not available for primary care only (total = 650,500) ^a	Not available for primary care only (total = 274,900) ^a	Not available for primary care only (total = 38,020) ^a
% Practices employing	Not available	Not available	Not Available
Years of basic education	All education is professional	At least 2–3 years of undergraduate study; usually 4 year undergraduate degree	No standardized training
Professional education	Bachelor's degree in social work (BSW – 4 years) or Masters degree in social work (MSW – 1–2 additional years)	4 year Doctor of Pharmacy (PharmD)	No standardized training
Special training	Multiple types, including advanced practice, independent, licensed clinical	Many categories of pharmacists	Not applicable
Accreditation of training	Association of Social Work Boards Licensing Examination	Requires two exams: national exam and state law exam	None. Some states are developing credentialing criteria
Licensing	State Social Work Board	State Pharmacy Board	Not applicable
Medical tasks	Assist people with solving problems in everyday lives, diagnose and treat mental, behavioral, and emotional issues	In general, pharmacists dispense prescription medications to patients and offer advice on safe use. Expanded roles in primary care include algorithm-based medication management for patients with chronic illness	Assist individuals and communities to adopt health behavior. Conduct outreach for medical personnel or health organizations to promote community programs. May provide information on available resources, provide social support and informal counseling, and advocate for individuals and community health needs. Can perform some basic screening procedures (i.e., blood pressure)
Professional organization	National Association of Social Workers	Many organizations, including American Pharmacists Association	No national organization. Some state have professional organizations
Salary per year (USD)	51,460 ^a (Healthcare Social Workers) – (not primary care specific)	114,950 ^a (not primary care specific)	37,490 ^a (not primary care specific)

Data source:

^a May 2012 National Occupational Employment and Wage Estimates, Bureau of Labor Statistics: http://www.bls.gov/oes/current/oes_nat.htm#29-0000 (accessed 10.05.13).

Medicare Benefit Schedule Item number for primary care practices to support team-based models of care. More specifically the funding items enable primary care physician-led care planning and access to Medicare Benefit Schedule-rebatable allied health services for clients with chronic disease and complex care needs. The Medicare Benefits Schedule (MBS) lists the range of consultations, procedures and tests, and the schedule fee for each item (for example, an appointment with a GP or blood tests to monitor cholesterol level). They include Coordination of 'Team Care Arrangements' (MBS Item 723) and 'GP Management Plans' (MBS Item 732). Medicare rebates are also available where registered nurses provide specific types of services on behalf of a primary care physician. In 2012, the Commonwealth government also introduced the 'Practice Nurse Incentive Program' to provide incentive payments to eligible practices to offset the costs of employing a registered nurse and support an expanded role for nurses working in primary care (61 'Medicare Locals' across Australia).

Although there is a willingness to shift from a traditional delegated care models to task substitution (Harris et al., 2011) current financial incentives (e.g.,

Medicare Benefit Schedule Funded Team Care Arrangements and GP Management Plans) still emphasize primary care physician-led care (as only general practitioners can claim the MBS Items) – hence not true shared/team care arrangements within primary care. Furthermore, true team care cannot take place until primary care physicians authorize or create supportive authorizing environments (i.e., with appropriate clinical governance and supervisory arrangements) for other members of their practice (e.g., general practice nurses, medical assistants) to perform intended roles and tasks.

2.4. England

Primary care in England is delivered mainly by a network of over 8000 primary care practices which are contracted to provide services by the National Health Service. In addition, pharmacies are considered a part of the English primary care service and registered pharmacists in many high street stores provide screening services, health advice and have some prescribing rights (Dawoud et al., 2011). Long established community nursing services provide nursing care in the home but also undertake some

aspects of chronic disease management that might generally be considered as 'primary care'.

Most general practices are partnerships of several primary care physicians (i.e., general practitioners) although there remain a substantial but declining number of solo practices and there are an increasing number of practices run by private companies who employ primary care physicians and others. The vast majority of the non-physician primary care workforce is directly employed by practices although other members of the primary care team (for example nurses) can be partners in a primary care practice. Team members employed in primary care are diverse although registered nurses and medical/nursing assistants (i.e., health care assistants) are the largest groups of direct care providers (Table 4).

There has been a steady increase in both the number of nurses employed in primary care and the proportion of consultations that are undertaken by them (Hippisley-Cox et al., 2007) although the growth appears to have plateaued in more recent years. This growth has been associated with the introduction of a pay-for-performance system linked to a number of chronic diseases where practice income was enhanced for meeting certain performance thresholds. The use of nurses to deliver performance against these targets was associated with increased quality of care and hence increased practice income (Griffiths et al., 2010). Registered nurses work in a variety of roles in primary care practices. Within the UK career framework for practice nurses there are no formal academic training requirements above those required for registration as a nurse and while many work at advanced levels there is no clear data, as job titles are not applied consistently and there are concerns that training for advanced roles is not always adequate or properly supported by employing practices (Rashid, 2010). The introduction of UK competency standards for practice nurses is a strategy that has sought to improve this situation (RCGP, 2012) although this largely relates to fundamental aspects of the role and is not explicit about training requirements. Registered nurses can undertake prescribing from the full formulary (i.e., the same prescribing powers as doctors) but only with additional training, a feature which is unique of UK nurses. Numbers of nurse prescribers are growing but only about 25% of nurses are so trained and many undertaking aspects of chronic disease management do not prescribe (Kelly et al., 2010). Training for medical assistants is primarily on the job and there are no formal educational requirements.

2.5. Germany

Primary care in Germany is mainly delivered by small- to middle-sized practices with 1–2 self-employed primary care physicians (i.e., *Allgemeinmediziner* or *Internisten*). As shown in Table 5, beside primary care physicians only one non-physician health professional (*Medizinische Fachangestellte*) is involved in primary care. This role is comparable to medical assistants in the US. Primary care physicians in Germany have a high number of patient visits per day (mean 34) with a mean consultation time of 7.8 min (The Commonwealth Fund, 2010). This may reflect working

practices in line with the traditional concept of "the-doctor-does-it-all". However, as a steadily decreasing number of primary care physicians faces an increasing number of patients with complex care needs, the roles of medical assistants have increasingly been expanded from administrative and simple medical tasks to more complex tasks like disease and care management (Gensichen et al., 2009; Peters-Klimm et al., 2010) and home visits (van den Berg et al., 2012). A number of optional special training programs are provided for medical assistants. Newly developed reimbursement schemes for primary care (e.g., GP-centered care contracts) increasingly compensates extra spending for specifically trained medical assistants which will likely increase the role expansion of medical assistants in German primary care. Since 2012, delegation of complex medical tasks to registered nurses is based on a legal framework. However, given an overall nurse shortage in Germany and a lack of nurses working in primary care (Mahler et al., 2007) it is questionable if nurses will play a major role in primary care in Germany in the near future.

2.6. The Netherlands

The Netherlands has a strong primary care system, with more than 90% of all care taking place in primary care for only 4% of total care budget (Wiegers et al., 2011). Primary care physicians (i.e., *huisarts*) are the gatekeepers of care. Historically they worked as solo practitioners, but since the 70s they have started working in partnerships with other primary care physicians. Although at a national level there is no primary care physician shortage, GP-trainees express less willingness to open practices in certain regions which might cause shortages in a number of regions in the near future (Schoots et al., 2012).

In the last two-and-a half decades, the roles of medical assistants (i.e., *Praktijk-doktersassistent*) have grown. Initially, these medical assistants have mainly performed administrative-organizational tasks, but their role has been expanded to perform medical-technical tasks (e.g., removes sutures, apply liquid nitrogen to warts, check blood pressure, check diabetic patients, et cetera) and patient education (e.g., instruct on blood sugar testing, provide dietary advice, provide information on animal and dust allergies, et cetera) (Engels et al., 2004). With the introduction of registered nurses into primary care (i.e., *Praktijkondersteuner/-verpleegkundige*) in 1999, the growth of responsibilities of medical assistants slowed. These registered nurses take care of patients with chronic conditions, especially diabetes, asthma/COPD and cardiovascular disease. For example, the nurse educates patients about the disease, instructs the patients how to take their medication, encourages patients to change lifestyle and monitors patients according to the evidence based guidelines (Wiegers et al., 2011). Certain tasks, in particular those related to the management of chronically ill patients (Heiligers et al., 2012), have shifted from medical assistants to registered nurses while some of the medical assistant roles have expanded to become similar to those of registered nurses (Table 6).

The employment of registered nurses is reimbursed, but only where three primary care physicians work in

Table 2
Primary care workforce of Canada.

Canada 35 Mio population ^a	Area A (general practitioner)	Area B (nurse practitioner/ physician assistant)	Area C (extended role practice nurse)	Area D (practice nurse)	Area E (practice nurse auxiliary)
Original name	Family physician	Primary Healthcare Nurse Practitioner (PHCNP)	–	Registered nurse	Licensed practical nurse (or registered practical nurse in Quebec and Ontario)
Total number	36,769 (2011) ^b	1626 (2010) ^k These data do not distinguish between types of NPs but the majority was primary health care NP	–	5473 (2010) ^m	Data not available in primary health care
% Practices employing Years of basic education (primary school + secondary school)	100% 11–13 yrs ^c	Data not available 11–13 yrs ^k	–	Data not available 11–13 yrs ⁿ	Data not available 11–13 yrs ^s
Professional education	Med school: 4–5 yrs, including clerkship ^c	A master's degree from an approved graduate level PHCNP program ^k	–	Entry-to-practice (ETP) programs Bachelor's degree ⁿ	Licensed practical nurse program (1–2 years)
Licensing	Yes Provincial College of Physicians ^d	Yes Provincial College of Registered Nurses ^k	–	Yes Provincial College of Registered Nurses ⁿ	Yes Provincial College of Licensed Practical Nurses ^s
Special training	Yes Residency: 2 yrs ^e	Yes About six months included in the master's degree	–	Yes Included in the program ^o	Yes/No Depending on the program
Accreditation of special training	Yes The examination of the College of Family Physicians of Canada + the Licentiate of the Medical Council of Canada ^{f,g,h}	Yes Canadian Nurse Practitioner Examination or examinations approved by the Province ^k	–	Yes Canadian Registered Nurse Examination by the Canadian Nurses Association (except in Quebec: examination of the provincial College of Registered Nurses) ^p	Yes Canadian Practical Nurse Registration Examination (CPNRE) in most provinces ± provincial examinations ^s
Medical tasks	Clinical diagnosis and treatment of all presentations ⁱ	The focus of their practice is health promotion, preventive care, diagnosis and treatment of acute common illnesses and injuries, and monitoring and management of stable chronic conditions ^k	–	They provide direct nursing care to patients, deliver health education programs and provide consultative services regarding issues relevant to the practice of nursing ^q	Provide nursing care usually under the direction of medical practitioners or registered nurses ^t
Professional organization	<i>Mandatory</i> Provincial College of Physicians	<i>Mandatory</i> Provincial College of Registered Nurses	–	<i>Mandatory</i> Provincial College of Registered Nurses	<i>Mandatory</i> Provincial College of Licensed Practical Nurses
Salary per year (USD)	240,000 (2010) ^j	65,000 (2011, median) ^l	–	34,000–67,000 ^r	33,000–55,000 ^u

^a <http://www.statcan.gc.ca/start-debut-fra.html> (accessed 14.05.13).

^b The Canadian Institute for Health Information. *Supply, Distribution and Migration of Canadian Physicians, 2011*. Ottawa, Ont.: CIHI; 2012.

^c The Association of Faculties of Medicine of Canada. *Admission Requirements of Canadian Faculties of Medicine, 2013*; http://www.afmc.ca/pdf/2013_ad_bk.pdf (accessed 14.05.13).

^d <http://www.hc-sc.gc.ca/hcs-sss/hhr-rhs/postgrad-postdoc/action-fam-eng.php> (accessed 14.05.13).

^e Oandasan, I., on behalf of the Working Group on Postgraduate Curriculum Review, 2011. Advancing Canada's family medicine curriculum: triple C. *Canadian Family Physician* 57 (6), 739–740.

^f <http://www.hc-sc.gc.ca/hcs-sss/hhr-rhs/postgrad-postdoc/action-fam-eng.php> (accessed 14.05.13).

- ^g <http://www.cfp.ca/FMExam/> (accessed 14.05.13).
- ^h <http://www.mcc.ca/en/exams/> (accessed 14.05.13).
- ⁱ http://www.servicecanada.gc.ca/eng/qc/job_futures/statistics/3112.shtml (accessed 14.05.13).
- ^j http://www.cma.ca/multimedia/CMA/Content/Images/Inside_cma/Membership/profiles/Family_en.pdf (accessed 14.05.13).
- ^k Donald, F., Martin-Misener, R., Bryant-Lukosius, D., Kilpatrick, K., Kaasalainen, S., Carter, N., Harbman, P., Bougeault, I., DiCenso, A., 2010. The primary healthcare nurse practitioner role in Canada. *Advances Practice Nursing* 23, 88–113.
- ^l Mathai, B., 2012. Nurse Practitioners in Canada. <http://healthcarecoopscanada.files.wordpress.com/2012/07/2012-03-nurse-practitioners-in-canada-2.pdf> (accessed 14.05.13).
- ^m Canadian Nurses Association. RN Workforce Profile by Area of Responsivibility, 2010. Ottawa 2012; <http://www.arnbc.ca/images/pdfs/news-cna/2010-Workforce-Profiles-of-RN.pdf> (accessed 14.05.13).
- ⁿ Canadian Institute for Health Information; http://www.cihi.ca/cihi-ext-portal/internet/en/document/spending+and+health+workforce/workforce/other+providers/hpdb_regnu (accessed 14.05.13).
- ^o Ordre des infirmières et infirmiers du Québec. Comparaison de la formation infirmière Québec–Autres provinces canadiennes, Québec 2011; http://www.oitq.org/sites/default/files/uploads/pdf/l_ordre/dossiers_strategies/Comparaison_formation.pdf (accessed 14.05.13).
- ^p Canadian Nurses Association. Becoming a RN; <http://www.cna-aaic.ca/en/becoming-an-rn/m-exam/> (accessed 14.05.13).
- ^q Canadian Nurses Association. Framework for the Practice of Registered Nurses in Canada, Ottawa 2007; http://www2.cna-aaic.ca/CNA/documents/pdf/publications/RN_Framework_Practice_2007_e.pdf (accessed 14.05.13).
- ^r http://www.workingincanada.gc.ca/job_search_results.do?searchstring=family+practice+m (accessed 14.05.13).
- ^s Canadian Institute for Health Information; http://www.cihi.ca/cihi-ext-portal/internet/en/document/spending+and+health+workforce/workforce/other+providers/hpdb_lispn (accessed 14.05.13).
- ^t http://www.servicecanada.gc.ca/eng/qc/job_futures/statistics/3233.shtml (accessed 14.05.13).
- ^u http://www.workingincanada.gc.ca/job_search_results.do?searchstring=licensed+practical+nurse (accessed 14.05.13).

collaboration and have a total patient size of 4500 patients. In 10 years, the number of registered nurses has grown substantially. Nowadays, almost all practices employ registered nurses to take care of patients with chronic conditions.

In 2008, a second covenant was signed introducing registered nurses specialized in mental health care to the primary care setting.

Nurse practitioners and physician assistants were introduced in 2001. These professionals followed, respectively, 2 year and 2.5 years master programs at the University of Applied Sciences. In contrast to the US, only 9–12% of all graduated nurse practitioners and physician assistants work in primary care practices. Nurse practitioners focus on patients with minor illnesses, whilst physician assistants share a broad range of work with the primary care physicians. Since January 2012, nurse practitioners and physician assistants are also allowed to prescribe drugs and perform certain tasks related to diagnosis and treatment independently.

Despite research showing positive effects of nurse practitioners and physician assistants on safety and quality of care as well as on patient outcomes (de Leeuw et al., 2008; Dierick-van Daele et al., 2009) the employment of these professionals is not strongly encouraged by professional organizations (i.e., the Dutch College of General Practitioners (NHG) and National Association of General Practitioners (LHV). In their policy the primary care physicians, medical assistants and ‘advanced’ registered nurses form the core team in primary care practices and not nurse practitioners and physician assistants “Although the NP and PA in the hospitals are employed to take over tasks such as diagnosis and treatment of patients, for general practice they are not taken over tasks from the GP in the medical field (NHG/LHV-Standpunt, 2011).” Therefore, the role of registered nurses, as members of the primary care team, will likely be further expanded: they will additionally be trained to carry out complex care (i.e., patient with multi-morbidity or social-psychiatric complaints), prevention and lifestyle counseling. However, the government launched a two-year incentive scheme “Strengthening Education nurse practitioners and physician assistants in general practice” to increase the number of positions of nurse practitioners and physician assistants in primary care. General practitioners who want to educate these non-physician professionals and intend to embed them in their primary care team in a fully integrated manner will receive a financial contribution during the education of these professionals (Stimuleringsregeling, 2013).

3. Skill mix in the international context

Primary care in many Western Countries faces common challenges.

On the one hand, numbers and working time of primary care physicians is decreasing due to a variety of reasons including an increasing proportion of female doctors preferring a work-life balance and working fewer hours or electing to work part-time. On the other hand patients’ numbers as well as care demand steadily increase.

Table 3
Primary care workforce of Australia.

Australia 22.3 Mio population	Area A (general practitioner)	Area B (nurse practitioner physician assistant)	Areas C and D (practice nurses and extended role practice nurse)	Area E (practice nurse auxiliary)
Original name	General practitioner	Nurse practitioner ^{a,e} /advanced nurse practitioner/nurse consultant	Senior Practice nurse/nurse specialist and practice nurse ^{c,e}	Medical assistant ^a
Total number	24,720 (2011)	Overall 595 in Australia in 2011 (of these 75 are in Victoria, Australia) Based on the 2012 AMLA GP Nurse survey ^b – 0.3% of nurses were nurse practitioners (i.e., only 2) in general practice	10,693 practice nurses in 2012 <i>Note:</i> In Australia, the Australian Nursing and Midwifery Board recognizes the titles of Nurse practitioner, registered nurse and enrolled nurses only 63%	76 qualified medical assistants are working across Queensland ^{a,d} (but also working in other states in territories) (not currently registered by the Australian Health Practitioner Registration Agency (AHPRA))
% Practices employing Years of basic education	100% 12	Not available 12	63% 12 <i>Note:</i> In Australia there are two categories of nurse regulated to practice: the registered nurse and the enrolled nurse (see http://anmf.org.au/documents/policies/P_Nursing_education_EN.pdf) Enrolled nurse education is provided at the Diploma and Advanced Diploma level of the Australian Qualification Framework	Not available 12
Professional education	Med School 4–6 yrs Internship 1 year GP training 3 years	Registered Nurse (3 years) + years full-time (or part-time equivalent Master of Nurse Practitioner Studies program)	Registered nurses (3 yrs), enrolled nurses, registered midwives	Certificate IV in Medical Practice Assisting (HLT43307) The course is a competency-based training program, duration varies depending on the trainee's existing qualifications, skills and experience. Without any prior knowledge, skills or experience, trainees are expected to complete the course over 12–18 months full-time, or 2 years part-time <i>Accreditation by:</i> Community Services and Health Industry Skills Council (CSHISC) as part of the National Health Training Package (NHTP)
Licensing	Royal Australian College of General Practitioners (RACGP) Fellowship <i>Mandatory</i>	Nursing and Midwifery Board of Australia	The professional regulation of RN, ENs and NPs is undertaken by a single national Nursing and Midwifery Board	
Special training	3 years general practice training	<i>Mandatory</i> Current registration as a Nurse in Australia. Bachelor of Nursing (or equivalent). A minimum of five years full-time equivalent (FTE) experience as a Registered Nurse including; three years FTE in a speciality area and one year FTE at an advanced practice level in the relevant speciality area of practice	None	None required
Accreditation of special training	Entry to general practice may be achieved by the admission to Fellowship of the Royal Australian College of General Practitioners (RACGP)	Nurse practitioners are registered nurses with advanced educational preparation and experience who are authorized to practice in an expanded nursing role in clinical settings as diverse as hospitals and aged care facilities, as well as in the community	Not applicable	Not applicable

Medical tasks	Clinical diagnosis and treatment of all presentations	Assessment and management using nursing knowledge and skills, direct referral of patients to other healthcare professionals, prescribing medications, ordering diagnostic investigations	Preventive activities (immunization, antenatal/postnatal, child health, adults checks, assessment, delivery of health promotion), care coordination (case management, preparing care plans, liaison with hospitals, undertake patient advocacy, conduct home visits), clinical activities (triage, suturing, sterilizing) <i>Note:</i> Competency standards for nurses in Australian general practice also exist (see http://anmf.org.au/documents/reports/compstandards_nursesingp.pdf)	Operate under the delegation of a supervising GP scope of practice Administrative and clinical-assist duties: confirm physical health status of patients; assist with clinical measurements and procedures; facilitate a care coordination, manage emergency cases and challenging patient behavior, apply first aid; handle specimens; clean re-usable instruments and equipment, and; maintain medication stocks, among other duties, manage front desk and patient contact None
Professional organization	Royal Australian College of General Practitioners	Australian College of Nurse Practitioners APNA	Australian Primary Health Care Nurses Association (APNA) Australian College of Nursing	
Salary per year (USD)	207,100	93,200	64,600	According to the RACGP due to the infancy of the role, salaries are yet to be determined

Data sources:

^a <http://www.nursepractitioners.org.au/>.

^b <http://www.racgp.org.au/download/Documents/PracticeSupport/information-sheet-medical-assistants.pdf>.

^c http://www.amlalliance.com.au/__data/assets/pdf_file/0003/46731/2012-General-Practice-Nurse-National-Survey-Report.pdf#2012%20National%20GPN%20Survey.

^d http://www.mnbml.com.au/content/Document/ma_infosheet.pdf.

^e Comment:

- Please note: The below definitions are not defined by the nurse registration authority in Australia.
- An advanced practice nurse who is a registered nurse who has acquired the expert knowledge base, complex decision-making skills and clinical competencies for expanded practice, the features of which are shaped by the context of the health service in which the practice is based (http://www.rcna.org.au/WCM/Images/RCNA_website/Files%20for%20upload%20and%20link/policy/documentation/position/advanced_practice_nursing.pdf).
- An advanced registered nurses Registered Nurse who is a person who has undertaken a bachelor level education program of not less than three years (prior to 1985, training was hospital based) and is licensed to practice nursing under an Australian state or territory Nurses Act http://rcna.org.au/WCM/Images/RCNA_website/Files%20for%20upload%20and%20link/nursing_in_general_practice_project_kit.pdf – based on 2012 AMLA GP Nurse survey - 12.6% of PNs are enrolled nurses.
- An advanced enrolled nurses Enrolled Nurse – a person who has undertaken a shorter program of education (usually in a vocational education setting), and is licensed under an Australian State or Territory Nurses Act to provide nursing care under the supervision of a Registered Nurse. http://rcna.org.au/WCM/Images/RCNA_website/Files%20for%20upload%20and%20link/nursing_in_general_practice_project_kit.pdf. Based on 2012 AMLA GP Nurse survey - 86.0% of PNs are enrolled nurses.

The 2012 AMLA PN Survey data (based on 709 nurse respondents) identified registered midwives and nurse practitioners working in general practice as well as general practice nurses. As all but six of the 72 registered midwives also reported they were registered nurses. Overall 12.6% of the population were enrolled nurses, 86.0% were registered nurses, 10.5% were registered midwives and 0.3% (two respondents) were nurse practitioners. BUT we DO NOT appear to have comprehensive information on nurses in advanced roles.

Despite the current investment in Australia to profile the health workforce, Australian based surveys of nurses do not ask about the specific workplace location (e.g., general practice setting) (Health Workforce Australia, 2013). Australia's Health Workforce Series – Nurses in focus. Health Workforce Australia: Adelaide, www.hwa.gov.au.

Table 4
Primary care workforce of England.

England 53 Mio population ~8100 primary care practices	Area A (general practitioner)	Area B (nurse practitioner/ physician assistant)	Area C (extended role practice nurse)	Area D (practice nurse)	Area E (practice nurse auxiliary)
Original name	General Practitioner	Nurse Practitioner/ Advanced Nurse Practitioner/Nurse Consultant	Senior Practice Nurse/Nurse Specialist	Practice Nurse	Health Care Assistant
Total number	40,265	23,458 (includes all practice employed registered nurses – detailed breakdown not readily available and role descriptors are not used consistently)			6700
% Practices employing	100%		95%		55%
Years of basic education	13		11		11
Professional education	5 years (basic training)		3 years		None required
Licensing	General Medical Council	Nursing and Midwifery Council	Nursing and Midwifery Council	Nursing and Midwifery Council	None
Special training	<i>Mandatory</i> MRCGP – 3 years	No formal requirements – job titles and roles applied in a non-standardized fashion. Prescribing can be undertaken only after additional training accredited by the Nursing and Midwifery Council			None required
Accreditation of special training	Royal College of General Practitioners	Advanced Nurse Practitioner Courses are available and the Royal College of Nursing Accredits masters level courses (1 year full time equivalent) but taking an accredited course is not a requirement. Prescribing can be undertaken only after additional training accredited by the Nursing and Midwifery Council			None
Medical tasks	Clinical diagnosis and treatment of all presentations	Ranges from clinical diagnosis and treatment of less complex presentations and some aspects of chronic care with considerable discretion, More commonly well-defined protocol-directed clinical care in specific areas including long term conditions: e.g., asthma, cervical screening, diabetes, HRT, contraception management through to “traditional” nursing care: e.g., immunization, ulcer management, management of minor injuries & phlebotomy			Simple, well- defined tasks that can be undertaken with limited training: e.g., urine analysis, simple dressings but also some ‘extended’ tasks including phlebotomy and blood pressure measurement
Professional organization	Royal College of General Practitioners	Royal College of Nursing	Royal College of Nursing	Royal College of Nursing	None
Salary per year (USD)	170,677	Overall average salary is approx. 50,344			26,641

Data source: RCGP General Practice Foundation|General Practice Nurse competencies, 2012.

In response to this situation, all six countries have created primary care teams with differing skill mix. While we have focused our paper on traditional primary care practices, because these remain the largest component of the service in most countries, other primary care services, for example nurse-led walk in centers, also reflect a change in skill mix with more non-physician practitioners. However, it is still the case that in all these countries the number of physicians working in primary care exceeds the number of non-physician health professionals. In general, as the complexity of medical tasks decreases, so does the remuneration of the health professionals. Although it has been shown that nurse practitioners and physician assistants are able to deliver at least 60% of office-based primary care (Ginsburg et al., 2009), numbers of nurse practitioners or physician assistants working in primary care are low in most of the countries. This may be due to a variety of factors, including extensive training requirements and significantly lower pay than similar positions in other specialties and when compared to that of

primary care physicians (Hooker, 1996). Whereas the role of registered nurses is similar in most countries we studied, including care coordination as well as clinical management of less complex cases (except in the US), the role of extended role practice nurses is less clearly defined. As an emerging trend, practice nurse auxiliary staff-like medical assistants or licensed practical nurses have increasingly been introduced in primary care teams in many countries. Their professional training varies greatly, with a range from no required training (England) to three-year curriculum at vocational school (Germany). However, practice nurse auxiliary staff share common tasks across all countries, mainly focusing on administration and simple clinical or nursing procedures under the supervision of doctors or nurses.

To meet the challenge of primary care in the 21st century workforce innovations are needed aiming at reduced workload for primary care physicians (Macdonnel and Darzi, 2013). A key element of these innovations is task shifting from physicians to non-physician health

Table 5
Primary care workforce of Germany.

Germany 82 Mio population Primary care practices	Area A (general practitioner)	Area B (nurse practitioner)	Area C (extended role practice nurse)	Area D (practice nurse)	Area E (practice nurse auxiliary)
Original name	Hausarzt/Kinderarzt	–	–	–	Medizinische Fachangestellte
Total number	41,712 general practitioners ^a 15,982 general internists ^a 6083 pediatricians ^a	–	–	–	100,700 ^b (2012)
% Practices employing	100%	–	–	–	100%
Years of basic education	12–13 yrs	–	–	–	9 yrs
Professional education	5 yrs curriculum at medical school	–	–	–	3 yrs curriculum: 1–2 days vocational school/week 4–3 days in practice/week
Licensing	Chamber of physicians	–	–	–	Chamber of physicians
Special training	<i>Mandatory</i> 5 yrs vocational training (either general practice or general internal medicine)	–	–	–	<i>Optional:</i> 200–420 h Different certified qualifications available (e.g., chronic care, wound care, home visits, prevention, quality management)
Accreditation of special training	Chamber of physicians	–	–	–	Chamber of physicians (not all special training programs)
Medical tasks	Clinical diagnosis and treatment of all presentations	–	–	–	- Taking blood samples - Intramuscular injections - ECG, spirometry - Patient education
Professional organization	<i>Mandatory:</i> Chamber of physicians <i>Optional:</i> German College of General Practitioners and Family Physicians German Association of General Practitioners	–	–	–	<i>Optional:</i> Verband medizinischer Fachberufe e.V.
Salary per year (USD)	135,777 ^c	–	–	–	23,730–41,118 ^d

Data sources:

^a <http://www.bundesaeztekammer.de/downloads/Stat11Abbildungsteil1.pdf>.

^b Bundesärztekammer. Personal communication 2013 May 7.

^c Guenterberg, K., Beer, C., 2010. Income of ambulatory physicians (Das Einkommen niedergelassener Ärzte. PaPfle Re Q 4, 87–93).

^d <http://www.aerztekammer-bw.de/30mefa/50tarifvertraege/10gehaltstarifvertrag.pdf>.

professionals. However, task shifting requires both willingness to give up tasks on physicians' side as well as the ability and capacity to perform these tasks on non-physician health professionals' side. The first requirement is commonly met in emerging countries (e.g., Brazil, India) where workforce innovations have more easily been implemented (Martiniano et al., 2014) partly because of a lack of established professional roles which in other circumstances may hamper task shifting by expectations and attitudes of each profession (Donelan et al., 2013; Macdonnel and Darzi, 2013). Non-physician health professionals' ability to perform specific tasks is dependent upon education and training. However, the number of highly trained non-physician health professionals like nurse practitioners or physician assistants employed in primary care is generally low. Furthermore, in some countries, notably the US, nurse practitioners are not consistently allowed to work independently from physicians thereby limiting their ability to compensate for shortages in the primary care workforce (Cassady, 2013). Current regulations and reimbursement schemes may also hinder role expansion of non-physician health professionals and paraprofessionals in many countries (Halcomb et al., 2008). Particularly, fee-for-service schemes may hamper

role expansion of non-physician health professionals if only services delivered by physicians are reimbursed. Capitation-based reimbursement schemes offer the opportunity to deliver non-billable services like health coaching as well as role expansion of medical assistants and other health workers. In the US, patient-centered medical home programs offer the opportunity to expand roles of non-physician health professionals such as medical assistants by capitation-based reimbursement (Nelson et al., 2010). Similar programs have been started in Australia (Naccarella et al., 2012), Canada (Ministry of Health and Long-term Care Canada, 2012) and Germany (Gerlach and Szecsenyi, 2013).

Task shifting from doctors to non-physician health professionals has raised two major concerns: patient safety/quality of care and decreasing continuity of care. To date evidence supporting each of these concerns is lacking. In contrast, a number of studies have shown that quality of care delivered by non-physician health professionals like nurse practitioner is not inferior if compared to physicians (Laurant et al., 2005, 2009; Naylor and Kurtzman, 2010). However, evidence on the quality and safety of care delivered by practice nurse auxiliary staff remains scarce (Gensichen et al., 2009; Nelson et al., 2010;

Table 6
Primary care workforce of the Netherlands.

Netherlands 16,8 Mio Population ~4,090 ^a primary care practices	Area A (general practitioner)	Area B (nurse practitioner)		Area C (extended role practice nurse)	Area D/Area E (practice nurse/ auxiliary)
Original name	Huisarts	Physician Assistant	Verpleegkundig Specialist	Praktijkonders-teuner (Somatiek of GGZ) of praktijkverpleeg-kundige Somatic disorders: 3000 (1550 ft) Mental health: 360 Somatic disorders: 80% Mental health: 25%	Praktijk-/doktersassistent
Total number	10,598	42 ^b –75 ⁱ	121 ^c –160 ⁱ		12.883 (6.629 ft)
% Practices employing	100%	<2%	<3%		100%
Years of basic education (primary school + secondary school)	14	13	13	12	12
Professional education	6 years medicine (academic/university)	4 year healthcare professional education (e.g., physical therapist, speech therapist, nursing, dietitian, etc. → professional Bachelor)+2 year working experience	4 year nursing education (professional Bachelor) +2 year working experience	4 year nursing education (professional Bachelor); or a nursing education at MBO- level ^f (qualification-level 4)/3 year MBO-level education 'praktijkassistent' (qualification- level 4) (appr. 42%) For mental health ('GGZ') 4 years nursing education, social work or psychology (professional Bachelor)	Various options for education, maximum 4 years MBO-level
Licensing	Registration Committee Medical Specialists (RGS) Individual Healthcare Professionas Act	CommissieAccreditatie NAPA National Association Physician Assistants Individual Healthcare Professionas Act	Nurse Practitioner Register (VSR) Individual Healthcare Professionas Act	Only professionals with nursing education licensed by Individual healthcare Professional Act	Not yet, but intention to get licensed by Individual healthcare Professional Act
Special training	<i>Mandatory:</i> 3 years specialization family medicine	<i>Mandatory:</i> 2.5 year Master at the University of Applied sciences	<i>Mandatory:</i> 2 year Master at the University of Applied sciences	<i>Optional:</i> 1 or 2 year dual post Bachelor education (combination practice and education), depending on basic education Appr. 48% Bachelor level (1 year special training) and 42% MBO-level (2 year special training). Education load varies from 420 to 850 h (1 year) and for extra year for professionals with MBO-level workload varies from 120 to 500 h	None
Accreditation of special training	Yes Since January 2013: Registration Committee MedicalSpecialists (RGS), before GP, nursing home and mental disabled doctor Registration Committee (HVRC)	Yes Accreditation Organization of the Netherlands and Flanders (NVAO)	Yes Accreditation Organization of the Netherlands and Flanders (NVAO)	None, although there is an agreement between schools that offer Post Bachelor Education and National Association of General Practitioners about competences of the practice nurses	N/A
Medical tasks	Clinical diagnosis and treatment of all presentations ^d	Clinical diagnosis and treatment of all presentations ^{e,h}	Clinical diagnosis and treatment of less complex presentations (minor illnesses) and also chronic care management ^{e,h}	(Well-defined) protocol-directed clinical care in specific areas: e.g., chronic care management; elderly; and mental health ^d	Health education and advice for simple complaints, and simple, (well-defined) protocol led medical tasks, e.g., (>60%) removes sutures, ear syringing, applicates liquid nitrogen to warts, removes splinters give injections, pap smears, checks blood pressure,write prescriptions requested by telephone for common complaints ^f Administrative-organizational tasks: e.g., >60% fills in forms with name/address/residence, calls up risk patients, sorts and handles mail, maintains supply of patient information leaflet. Enter basic data from specialist correspondence, operate answering machine

Professional organization	Optional: Dutch College of General Practitioners (NHG) National Association of General Practitioners (LHV)	Mandatory (in order to be licensed): Netherlands Association of Physician Assistants (NAPA)	Optional: Nurses and Caregivers Netherlands – Nurse Practitioners (V&VN-VS)	Optional: Dutch Association Practice Nurses (NvPO); Nurses and Caregivers Netherlands – Practice Nurses (V&VN-praktijkondersteuners); Dutch Association for Practice Assistants (NVDA)	Optional: Dutch Association for Practice Assistants (NVDA)
Salary per year (USD)	GP employed by GP practice owner: 79,300–102,600 GP practice owner: 125,300–167,000 ^g	60,000–84,700	54,700–70,400	39,200–53,600	37,600–46,750

Data sources:

^a Hingstman, L., Kenens, R.J., 2011. Cijfers uit de registratie van huisartsen. Peiling. Utrecht: Nivel.

^b Van der Velde, F., van der Windt, W., 2013. Alumni van de masteropleiding Physician Assistant. Utrecht: Kiwa Prismant.

^c Van der Velde, F., van der Windt, W., 2013. Alumni van de masteropleiding Advanced Nursing Practice. Utrecht: Kiwa Prismant.

^d Heiligers, P.J.M., Noordman, J., Korevaar, J.C., Dorsman, S., Hiingsman, L., van Dulmen, A.M., de Bakker, D.H., 2012. Kennisvraag. Praktijkondersteuners in de huisartspraktijk (POH's), klaar voor de toekomst? Utrecht: Nivel.

^e Eindrapport Nurse Practitioner in de huisartsenpraktijk. Onderzoeksrapport Auteurs: Dierick-van Daele ATM, Metsemakers JFM, Derckx EWCC, Spreeuwenberg C & Vrijhoef HJM. Uitgave: Maastricht UMC, 2008.

^f Engels, Y., Mokkink, H., van den Homberth, P., van den Bosch, W., van den Hoogen, Grol R., 2004. Het aantal taken van de praktijkassistnet in de huisartsenpraktijk is toegenomen. Huisarts wen Wetenschap 47(7), 325–330.

^g <http://lhv.artsennet.nl/Actueel/Nieuws6/Nieuwsartikel/Nieuwe-CBScijfers-over-inkomen-huisarts-uitspraken-minister-volstrekt-onjuist.htm>.

^h Laurant, M., Wijers, N., 2014. Een studie naar functieprofielen, taken en verantwoordelijkheden van Physician Assistants en Verpleegkundig Specialisten werkzaam in de huisartsenzorg. Nijmegen: IQ healthcare/Radboudumc.

ⁱ Personal communication Stuurgroep Taakherschikking Eerstelij (19 juni 2014): estimation 75 PAs and 160 NPs general practice.

^j *Comment:* MBO-level is equal to further education colleges in England, and community colleges in United States.

Peters-Klimm et al., 2010). Introducing protocol-based care (e.g., standing orders for medication refill) may further help to facilitate task shifting as it may face problems deriving from limited training and lack of legal accountability (Ghorob and Bodenheimer, 2012).

Adding members to care teams obviously increases the risk of decreasing continuity of care if defined as 'seeing-the-same-health-care-provider-every-time'. However, electronic health records shared across all team members may at least in part overcome the potential harms of increasing numbers of health care providers per case (Green et al., 2013). Finally, the notion of delegating tasks 'downward' to non-physician health professionals has increasingly been replaced by efforts to form 'care teams' in all countries under study. Although further attempts to promote team constitution are greatly needed in all of the countries, awareness and appreciation of each team 'players' role may be the first step and facilitated by this overview.

Accountability for patient care may best be shared across different members of the primary care team if sufficient training is provided, information is shared timely and comprehensively among all team members and reimbursement schemes account for services delivered by non-physician health professionals. Benefits should be weighed against national or regional legislation and requirements, but this paper provides insight into a variety of skill mix changes implemented in six countries. This information can be utilized to develop strategies to maintain access to primary care and quality of care delivery. In this manner, countries may learn from international experiences provided that the system-specific context of skill mix reviewed in this paper is acknowledged.

Funding

This work has not received any external funding.

References

- Australian Medical Workforce Advisory Committee, 2005. The general practice workforce in Australia. AMWAC report 2005. Available at <http://www.ahwo.gov.au/documents/Publications/2005/The%20general%20practice%20workforce%20in%20Australia%20-%20Summary.pdf> (accessed 28.05.13).
- Australian Medicare Local Alliance, 2012. General practice nurse national survey report, 2012. Available at http://amlalliance.com.au/__data/assets/pdf_file/0003/46731/2012-General-Practice-Nurse-National-Survey-Report.pdf (accessed 28.05.13).
- Bodenheimer, T., Laing, B.Y., 2007. The teamlet model of primary care. *Ann. Fam. Med.* 5 (5), 457–461.
- Buchan, J., Dal Poz, M.R., 2002. Skill mix in the health care workforce: reviewing the evidence. *Bull. World Health Organ.* 80 (7), 575–580.
- Canadian Intergovernmental Conference Secretariat, 2000. Ontario Communiqué on Health First Ministers' Meeting Ottawa. Available at <http://www.scics.gc.ca/english/conferences.asp?x=1&a=viewdocument&id=688> (accessed 16.05.13).
- Cassady, A., 2013. Nurse practitioners and primary care. *Health Aff. (Millwood)*, http://healthaffairs.org/healthpolicybriefs/brief_pdfs/healthpolicybrief_92.pdf.
- Dawoud, D., Griffiths, P., Maben, J., Goodyer, L., Greene, R., 2011. Pharmacist supplementary prescribing: a step toward more independence? *Res. Soc. Adm. Pharm.* 7 (3), 246–256.
- de Leeuw, J.R.J., Simkens, A.B.M., van Baar, M.E., van Balen, F.A.M., Verheij, R.A., Bijleveld, S.D., 2008. *Eindrapport Taakherschikking in de huisartsenpraktijk: introductie van de Physisian Assistant*. UMC Utrecht, Julius Centrum, Utrecht.
- Dierckx-van Daele, A.T., Metsemakers, J.F., Derckx, E.W., Spreeuwenberg, C., Vrijhoef, H.J., 2009. Nurse practitioners substituting for general practitioners: randomized controlled trial. *J. Adv. Nurs.* 65 (2), 391–401.
- Donald, F., Martin-Misener, R., Bryant-Lukosius, D., Kilpatrick, K., Kaasalainen, S., Carter, N., Harbman, P., Bourgeault, I., DiCenso, A., 2010. The primary healthcare nurse practitioner role in Canada. *Can. J. Nurs. Leadersh.* 23, 88–113.
- Donelan, K., DesRoches, C.M., Dittus, R.S., Buerhaus, P., 2013. Perspectives of physicians and nurse practitioners on primary care practice. *N. Engl. J. Med.* 368, 1898–1906.
- Engels, Y., Mokkink, H., van den Hombergh, P., van den Bosch, W., van den Hoogen, H., Grol, R., 2004. Het aantal taken van de praktijkassistente in de huisartsenpraktijk is toegenomen. *Huisarts en Wetenschap* 47 (7), 325–330.
- Gensichen, J., von Korff, M., Peitz, M., Muth, C., Beyer, M., Güthlin, C., Torge, M., Petersen, J.J., Rosemann, T., König, J., Gerlach, F.M., 2009. Case management for depression by health care assistants in small primary care practices: a cluster randomized trial. *Ann. Intern. Med.* 151 (6), 369–378.
- Gerlach, F.M., Szeceenyi, J., 2013. Family practice centered care in Baden-Württemberg: is it successful in overcoming the organized irresponsibility? *Z. Evid. Fortbild. Qual. Gesundheitswes* 107 (6), 363–364.
- Ghorob, A., Bodenheimer, T., 2012. Sharing the care to improve access to primary care. *N. Engl. J. Med.* 366 (21), 1955–1957.
- Ginsburg, J., Taylor, T., Barr, M.S., 2009. *Nurse Practitioners in Primary Care*. American College of Physicians, Philadelphia, PA (Policy Monograph).
- Green, L.V., Savin, S., Lu, Y., 2013. Primary care physician shortages could be eliminated through use of teams, nonphysicians, and electronic communication. *Health Aff. (Millwood)* 32 (1), 11–19.
- Griffiths, P., Murrells, T., Maben, J., Jones, S., Ashworth, M., 2010. Nurse staffing and quality of care in UK general practice: cross-sectional study using routinely collected data. *Br. J. Gen. Pract.* 60 (1), e36–e48.
- Halcomb, E.J., Davidson, P.M., Salamonson, Y., Ollerton, R., Griffiths, R., 2008. Nurses in Australian general practice: implications for chronic disease management. *J. Clin. Nurs.* 17 (5A), 6–15.
- Harris, M.F., Zwar, N.A., Walker, C.F., Knight, S.M., 2011. Strategic approaches to the development of Australia's future primary care workforce. *Med. J. Aust.* 194 (11), S88–S91.
- Health Canada, 2012. Available at: <http://www.hc-sc.gc.ca/hcs-sss/prim/about-apropos-eng.php> (accessed 16.05.13).
- Heiligers, P.J.M., Noordman, J., Korevaar, J.C., Dossman, S., Hingsman, L., van Dulmen, A.M., 2012. Kennisvraag. Praktijkondersteuners in de huisartspraktijk (POH's), klaar voor de toekomst? Nivel, Utrecht.
- Hippisley-Cox, J., Fenty, J., Heaps, M., 2007. Trends in Consultation Rates in General Practice 1995 to 2006: Analysis of the QRESEARCH database. NHS Information Centre.
- Hofer, A.N., Abraham, J.M., Moscovice, I., 2011. Expansion of coverage under the Patient Protection and Affordable Care Act and primary care utilization. *Milbank Q.* 89 (1), 69–89.
- Hooker, R.S., 1996. Determinants of specialty choice of physician assistants. *Acad. Med.* 71 (8), 917–919.
- Interbank Currency Exchange Rate, 2013. Available at: <http://www.oanda.com/lang/de/currency/average> (accessed 28.05.13).
- Kelly, A., Neale, J., Rollings, R., 2010. Barriers to extended nurse prescribing among practice nurses. *Community Pract.* 83 (1), 21–24.
- Kernick, D.P., 1999. Nurses and doctors in primary care: decisions should be based on maximizing the cost effectiveness of a system of primary care and not the dictates of historical precedent. *Br. J. Gen. Pract.* 49 (445), 647–649.
- Laurant, M., Reeves, D., Hermens, R., Braspenning, J., Grol, R., Sibbald, B., 2005. Substitution of doctors by nurses in primary care. *Cochrane Database Syst. Rev.* (4), CD001271.
- Laurant, M., Harmsen, M., Wollersheim, H.C., Grol, R., Faber, M.J., Sibbald, B., 2009. The impact of non-physician clinicians: do they improve the quality of cost-effectiveness of healthcare services? *Med. Care Res. Rev.* 66 (6 Suppl.), 365–395.
- Macdonnell, M., Darzi, A., 2013. A key to slower health spending growth worldwide will be unlocking innovation to reduce the labor-intensity of care. *Health Aff. (Millwood)* 32 (4), 653–660.
- Mahler, C., Trieschmann, J., Szeceenyi, J., Rosemann, T., 2007. Fortbildungsmotivation von Arzthelferinnen – Ergebnisse einer Befragung. (-Motivation for continuous education of medical assistants-survey results). *Z. Allgemeinmed.* 83, 191–196.
- Margolius, D., Bodenheimer, T., 2010. Transforming primary care: from past practice to the practice of the future. *Health Aff. (Millwood)* 29 (5), 779–784.

- Martiniano, C.S., Coêlho, A.A., Latter, S., da Costa Uchôa, S.A., 2014. Medication prescription by nurses and the case of the Brazil: what can we learn from international research? *Int. J. Nurs. Stud.* 51 (8), 1071–1073.
- MBS Items, 2014. Available at: <http://www.health.gov.au/internet/main/publishing.nsf/content/mbsprimarycare-chronicdiseaseamangement> (accessed 09.11.14).
- Ministry of Health and Long-term Care Canada, 2012. Available at: http://www.health.gov.on.ca/en/pro/programs/fht/fht_progress.aspx (accessed 16.05.13).
- Naccarella, L., Greenstock, L., Brooks, P., 2012. Building the capacity of the system for team-based models of primary care: a framework for action. *Med. J. Aust. Health Workforce Suppl.* 2 (1), 22–25.
- Naylor, M.D., Kurtzman, E.Z., 2010. The role of nurse practitioners in reinventing primary care. *Health Aff. (Millwood)* 29 (5), 893–899.
- Nelson, K., Pitaro, M., Tzellas, A., Lum, A., 2010. Transforming the role of medical assistants in chronic disease management. *Health Aff. (Millwood)* 29 (5), 963–965.
- NHG/LHV-Standpunt, 2011. Het (ondersteunend) team in de huisartsenvoorziening. Actualisering van het NHG/LHV-Standpunt 'Ondersteunend personeel in de huisartsenvoorziening' uit 2005. Vastgesteld in de Algemene Ledenvergadering van het NHG op 9 juni 2011. NHG/LHV, Utrecht. Available at: <https://www.lhv.nl/standpunten/lhvnhg-standpunt-ondersteunend-personeel-de-huisartsenzorg> (accessed 8.11.14).
- OECD, 2012. Health at a Glance: Europe 2012 [Internet]. OECD Publishing, <http://dx.doi.org/10.1787/9789264183896-en> (accessed 25.05.13).
- Peters-Klimm, F., Campbell, S., Hermann, K., Kunz, C.U., Müller-Tasch, T., Szecsenyi, J., 2010. Case management for patients with chronic systolic heart failure in primary care: the HICMan exploratory randomised controlled trial. *Trials* 11, 56.
- Pettersson, S.M., Liaw, W.R., Phillips, R.L., Meyers, D.S., Bazemore, A.W., 2012. Projecting US primary care physician workforce needs: 2010–2025. *Ann. Fam. Med.* 10, 503–509.
- Rashid, C., 2010. Benefits and limitations of nurses taking on aspects of the clinical role of doctors in primary care: integrative literature review. *J. Adv. Nurs.* 66 (8), 1658–1670.
- RCGP General Practice Foundation|General Practice Nurse competencies, 2012. <http://www.rcgp.org.uk/membership/practice-teams-nurses-and-managers/~media/Files/Membership/GPF/RCGP-GPF-Nurse-Competencies.ashx>.
- Richards, A., Carley, J., Jenkins-Clarke, S., Richards, D.A., 2000. Skill mix between nurses and doctors working in primary care-delegation or allocation: a review of the literature. *Int. J. Nurs. Stud.* 37 (3), 185–197.
- Romanow, R.J., 2002. Building on values: the future of health care in Canada. Commission on the Future of Health Care in Canada, Ottawa, ON. Available at: <http://publications.gc.ca/collections/Collection/CP32-85-2002E.pdf> (accessed 16.05.13).
- Schoots, M., Honkoop, P., Dunselman, H., Joziassse, I., 2012. Waar wil 'de nieuwe huisarts' zich vestigen? *Huisarts en Wetenschap* 55 (11), 494–499.
- Sibbald, B., Shen, J., McBride, A., 2004. Changing the skill-mix of the health care workforce. *J. Health Serv. Res. Policy* 9 (1 Suppl.), 28–38.
- Smith, M., Bates, D.W., Bodenheimer, T., Cleary, P.D., 2010. Why pharmacists belong in the medical home. *Health Aff. (Millwood)* 29 (5), 906–913.
- Stimuleringsregeling VS PA, 2013. Available at: <https://www.stichtingkoh.nl/zorgmasters-vs-pa/stimuleringsregeling-vs-pa/> (accessed 10.01.14).
- Swartz, M.D., 2012. The US primary care workforce and graduate medical education policy. *J. Am. Med. Assoc.* 308, 2252–2253.
- The Commonwealth Fund, 2010. Commonwealth Fund International Health Policy Survey, 2013. Available at: <http://www.commonwealthfund.org/Surveys/2010/Nov/2010-International-Survey.aspx> (accessed 28.05.13).
- Tinetti, M.E., Fried, T.R., Boyd, C.M., 2012. Designing health care for the most common chronic condition – multimorbidity. *J. Am. Med. Assoc.* 307 (23), 2493–2494.
- van den Berg, N., Heymann, R., Meinke, C., Baumeister, S.E., Flessa, S., Hoffmann, W., 2012. Effect of the delegation of GP-home visits on the development of the number of patients in an ambulatory healthcare centre in Germany. *BMC Health Serv. Res.* 12, 355.
- Wiegers, T., Hopman, P., Kringos, D., de Bakker, D., 2011. Overzichtstudies De eerstelijns. NIVEL, Utrecht.