



Utilization of registered nurses in primary care teams: A systematic review



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ABSTRACT

Background: Registered nurses are increasingly becoming embedded in primary care teams yet there is a wide variability in nursing roles and responsibilities across organizations. Policy makers are calling for a closer look at how to best utilize registered nurses in primary care teams. Lack of knowledge about effective primary care nursing roles and responsibilities challenges policy makers' abilities to develop recommendations to effectively deploy registered nurses in primary care needed to assure efficient, evidence-based, and quality health care.

Objective: To synthesize international evidence about primary care RN roles and responsibilities to make recommendations for maximizing the contributions of RNs in team-based primary care models.

Design: Systematic review.

Data sources: The Meta-Analysis and Systematic Reviews of Observational Studies framework guided the conduct of this review. Five electronic databases (OVID Medline, CINAHL, EMBASE, PubMed and Cochrane Library) were searched using MeSH terms: primary care, roles, and responsibilities. The term "nurs*" was truncated to identify all literature relevant to nursing.

Review methods: The initial search yielded 2243. Abstracts and titles were screened for relevance and seventy-one full text reviews were completed by two researchers. Inclusion criteria included: (1) registered nurses practicing in interprofessional teams; (2) description of registered nursing roles and responsibilities; (3) primary care setting. All eligible studies underwent quality appraisal using the Integrative Quality Criteria for Review of Multiple Study Designs tool.

Results: Eighteen studies met eligibility across six countries: Australia, United States, Spain, Canada, New Zealand, and South Africa. Registered nurses play a large role in chronic disease management, patient education, medication management, and often can shift between clinical and administrative responsibilities. There are a limited number of registered nurses that participate in primary care policy making and research.

Conclusion: Integrating registered nurses into primary care has the potential to increase patient access to a primary care provider because registered nurses can supplement some of the provider workload: they renew prescriptions, address patient questions, and provide patient education. Clear practice protocols and nursing policy should be written by registered nurses to ensure safe, and effective nursing care. The use of a medical assistant or nurse's aide to perform non-nursing tasks allows registered nurses to take on more complex patient care. Future research should expand on emerging payment models for nurse-specific tasks.

What is already known about the topic?

- A current global healthcare professional shortage requires the best utilization of the existing primary care workforce, including registered nurses, that are needed to meet the demand for effective primary care services.
- RNs are increasingly being embedded into primary care teams and policy makers and administrators are seeking evidence to optimally utilize registered nurses in these teams.

What this paper adds

- This review demonstrates that nurses play a vital role in chronic disease management, care coordination, pharmaceutical management, and contributions to pediatric and women's health care delivery.
- The use of clearly delineated protocols and standardized responsibilities increase the number of tasks that nurses can perform without provider oversight, subsequently reducing primary care provider

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strain and increasing patients' access to care.

1. Introduction

Globally, the demand for primary care services is increasing as the population is aging and many patients live longer with multiple chronic diseases. Patients require on-going primary care services, such as monitoring of their conditions, and follow up (Wu and Green, 2000). In addition to the increased demands for health care services, many countries are facing severe shortages of primary care providers. The World Health Organization estimates that 4.3 million physicians, midwives, nurses and support workers are needed to meet the health care needs of patients worldwide (World Health Organization, 2006). The United States (US) alone will need an additional 52,000 primary care physicians by 2025 to meet the demand for primary care services (Pettersen et al., 2012). In Spain, almost 70% of all health care is delivered in the primary care setting yet there are twice as many physician specialists as primary care physicians (Barber and López-Valcárcel, 2010; Borkan et al., 2010; Ministry of Health and Social Policy et al., 2010). The increased demand for primary care services has prompted national policymakers, such as those in the United Kingdom, to allocate substantial funding toward ensuring adequate primary care delivery by 2020 (Schilling, 2015).

Traditionally, primary care delivery models rely on physician workforce to deliver care to patients. In such models, patients are typically assigned to a single primary care provider, also known as a general practitioner, who is responsible for a range of patient care activities including the assessment, diagnosis, and treatment across multiple visits, as well as helping patients navigate throughout the healthcare system (Haggerty et al., 2003). While these models have been in practice for a long time, such models of care delivery are no longer adequate. For example, one study conducted in the United States estimates that a single primary care provider working alone would need an estimated 21 h per day to fulfill all recommended patient care guidelines (Yarnall et al., 2009). Thus most recommendations that focus on improving patients' access to care, and promote the quality of patient care, emphasize the importance of team-based care delivery models (Colwill et al., 2008; Green et al., 2013; Saba et al., 2012). In such models, clinicians from various disciplines, including physicians, nurses, pharmacists, social workers and others, collaborate to deliver care to patients.

In recent years, researchers investigated the composition and performance of interprofessional primary care, specifically interprofessional teams composed of physicians, nurse practitioners, physician assistants, and pharmacists, to research their delivery of patient care (Dey et al., 2011; Lenander et al., 2014; Proia et al., 2014). Today registered nurses (RN) are increasingly embedded into interprofessional primary care teams (Ladden et al., 2013). The integration of nurses into primary care teams shows a promise for enhanced patient care and improved clinical outcomes (Condon et al., 2000; Halper, 2009; Holtrop et al., 2008; Proia et al., 2014). However, health care organizations employing RNs often struggle with differences in nursing roles and titles. RNs are licensed professionals, that require a baccalaureate degree for entry into practice in some countries (Rheume, 2003). In other countries, such as the US, RNs can practice with an associate or baccalaureate degree and are eligible for the same RN licensure. Internationally, RNs who are specifically employed within primary care in Australia, also called general practice, are referred to as "practice nurses" (Price, 2007). In contrast, "practice nursing" in the United Kingdom is an advanced practice nursing role, requiring Master's degree education, and is similar to a nurse practitioner role in the US and Canada (Atkin and Lunt, 1996). In South Africa, nurses working in primary care are called "community nurses" (Leech et al., 2007). The lack of consistency in nursing education and titles makes it challenging to define appropriate nursing tasks and complicates the description of nursing functions in primary care teams (Price, 2007). While nursing

roles and responsibilities in acute care teams have been clearly defined, there is still a great variability in nursing roles and responsibilities in primary care (Akeroyd et al., 2009; Baggs et al., 1999; Smith et al., 2006).

Policy makers and health care administrators are searching for evidence to better understand the roles and responsibilities of RNs in primary care. A comprehensive understanding of RN skills and impact on patient care will help to develop care delivery models that effectively utilize RN qualifications to increase the primary care capacity (Keleher et al., 2009). For example, policy organizations, such as the American Academy of Nursing, partnered with the Josiah Macy Foundation, are calling for effective integration of RNs in primary care (Josiah Macy Foundation, 2016). The objective of this review is to synthesize international evidence about primary care RN roles and responsibilities to make recommendations for maximizing the contributions of RNs in team-based primary care models.

2. Methods

2.1. Literature search

The Meta-Analysis and Systematic Reviews of Observational Studies (MOOSE) framework guided the conduct of this review (Stroup et al., 2000). The primary researcher has expertise in health services research and is a board-certified nurse practitioner (advanced practice registered nurse) practicing in primary care. Two researchers have expertise investigating health care and nursing policy, organizational structures in health care settings, and practice environments of health care providers, both of whom are doctoral prepared RNs. A fourth researcher has expertise in mental illness workforce research and is a board-certified psychiatric nurse practitioner. In an effort to identify all eligible studies, a comprehensive search was conducted across five electronic databases including OVID Medline, CINAHL, EMBASE, PubMed and Cochrane Library; and Google Scholar for gray literature including abstracts, conference proceedings, and unpublished manuscripts. We conducted our literature search from November 2015 to January 2016. No time limits were applied during the search. MeSH terms (Medical Subject Headings) were searched using boolean terms: "primary health care" AND "nurs*" AND ("roles" OR "responsibilities"). The term "nurs*" was truncated and exploded to identify all literature relevant to "nurses" or "nursing" with potential eligibility.

2.2. Inclusion and exclusion criteria

The following criteria were applied during the literature search.

Inclusion criteria

- Studies that included the use of registered nurses practicing in interprofessional teams.
- Studies that provided a description of nursing roles and responsibilities.
- Studies that were conducted in a primary care setting.

Exclusion criteria

- The nursing role description was only specific to advanced practice nursing, such as nurse practitioners.
- The role description was specific to other medical disciplines, such as physicians or physician assistants.
- The study was conducted in acute care only.
- The study examined an ambulatory setting other than primary care, such as a specialist's office.

2.3. Data extraction and synthesis

Following the identification of eligible studies, we condensed each

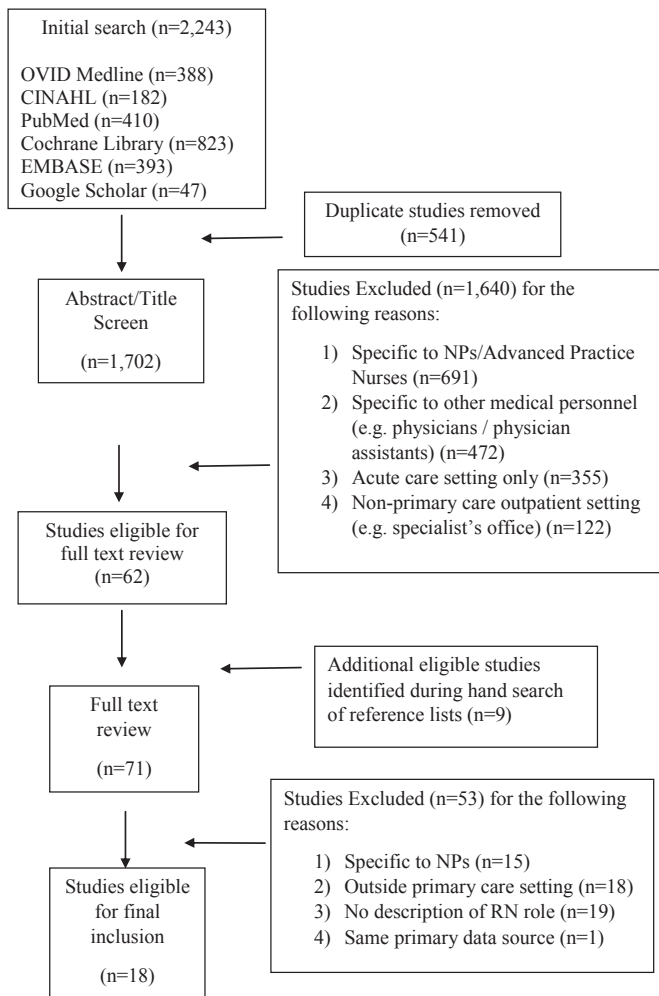


Fig. 1. Flow diagram of literature search.

study into a one page summary that included study design, sample, data collection methods, and key findings. Next, we extracted data about nursing roles and responsibilities from each study and consolidated in a spreadsheet. The data were independently coded by two researchers based on the type of nursing tasks. During weekly meetings, we grouped tasks and responsibilities into categories and subsequent themes for the presentation of the findings.

3. Results

The results of our literature search are presented in Fig. 1. The initial search yielded 2243 studies, which were imported into Endnote7 reference manager. The first author reviewed the titles of the studies and removed 541 duplicates. Then, the abstracts and titles were screened by two researchers, and studies that met the inclusion criteria were retained for the full text review ($n = 62$). Next, the reference lists of the selected studies were hand searched for relevant studies. Abstracts and unpublished studies were not included in the review because there was no data to extract for synthesis. Nine additional studies met the inclusion criteria and were included in the full text review ($n = 71$). We initially could not retrieve the full text of two studies that had been conducted in Australia. We contacted a nursing colleague in Australia via email who was able to assist in acquiring the full text and the publications were emailed to the primary researcher. There was no direct contact with any of the included studies' authors. Inclusion and exclusion criteria were reapplied to the remaining full texts, and studies were excluded for the following reasons: (1) Specific to advanced practice nursing, such as NPs ($n = 15$); (2) Study conducted outside

primary care ambulatory setting ($n = 18$); and (3) No description of roles specific to RNs discussed ($n = 19$). Two studies used the same primary data and one was removed based on the lack of detailed description of RN responsibilities in the publication ($n = 1$).

Eighteen studies met the eligibility for inclusion and reported frequency and descriptions of nursing roles and responsibilities in primary care. All studies were available in the English language. We chose not to limit the review to any specific study design due to both the quantitative and qualitative nature of reporting nursing roles and responsibilities.

3.1. Quality appraisal

The eligible studies were independently appraised by two researchers using the Integrative Quality Criteria for Review of Multiple Study Designs tool (Zingg et al., 2016). This is a comprehensive tool that allows a two-part evaluation of quality across different study designs for the purpose of synthesizing studies in an integrative or systematic review. First, using a scoring system, each study was appraised using pre-validated quality components. A study earned two points for each design-specific criterion that was met, one point if it was unclear, and zero points if the criterion was unmet. The total sum of points was then applied to the tool's scoring criteria. The second part of the ICROMS appraisal tool is to determine if each study meets design-specific mandatory criteria, such as the inclusion of clear aims, the management of bias in sampling and measurement, and analytic rigor. The two researchers reached a consensus that each of the eligible studies had exemplified sufficient quality to extract data and be included in the synthesis of findings. One of the primary threats to quality were small sample sizes. However, since the purpose of this review was to explore all reported RN responsibilities in primary care, we felt that all findings should be collectively reported.

3.2. Study characteristics

Eighteen studies met eligibility for inclusion (Table 1). Two authors reached 100% consensus of quality appraisal and found that all 18 studies met the mandatory criteria and minimum design-specific quality score for inclusion in this review. Six studies utilized mixed methods, four used qualitative designs, six used cross-sectional design, one case study and one observational study. Studies were conducted across six countries: Australia ($n = 8$); United States ($n = 5$); Canada ($n = 2$); New Zealand ($n = 1$); Spain ($n = 1$); and South Africa ($n = 1$). The samples of the studies were predominantly female (range 95–99%), with a mean age range of 42–52.3 years old. One study conducted in Canada reported that almost half of the RN sample was over the age of 50 (Todd et al., 2007). The studies were conducted in different health care settings that deliver primary care, including but not limited to, clinics, physician group practices, community health centers, academic primary care offices, hospital-affiliated primary care centers, and government funded clinics. An overview of common roles and responsibilities are explained below. This is followed by a closer look at RN contributions to chronic disease management, pharmaceutical management, care coordination, and RN roles specific to pediatric populations and women's health.

3.3. RN responsibilities within health care teams

The interprofessional teams utilizing RNs significantly varied in terms of the composition of team members across the studies. In one Australian study, almost 65% of RNs worked in a primary care team with another RN (Pascoe et al., 2005). In contrast, in a study conducted in the US it was typical for one RN to work with four physicians (Ladden et al., 2013). RNs in New Zealand and Spain functioned as a complementary role to the primary care provider during patient visits and the effective utilization of RNs was often dependent on delegation

Table 1
Study characteristics.

Study	Country	Aim	Design	Sample	Measures	Setting Type
Anderson et al., 2012	United States	To explore the role of nursing in the PCMH, beginning with an exploration and assessment of roles, responsibilities and tasks of the generalist primary care nurse	Observational	RNs (10)	Observation	Federally Qualified Health Center
Condon et al., 2000	Australia	To identify areas of effective shared care between GPs and PNs	Qualitative	RN (11) GP/RN team (8) GP alone (1) GP/NP team (1) RNs (284)	Semi-structured interviews	General Practices (urban/rural)
Halcomb et al., 2008	Australia	To describe the demographic and employment characteristics of Australian PNs and explore the relationship between these characteristics and the nurses' role	Mixed method		National Mail survey	Group Practices
Joyce and Piterman, 2011	Australia	To describe the patient consultations of nurses in Australian general practice, including patient characteristics, reasons for the consultation, treatments provided and other actions taken	Cross sectional	5253 RN-patient encounters (50/RN)	National Survey	General Practices
Keleher and Parker, 2013	Australia	To report an analysis of the health promotion/prevention work reported by RNs	Cross sectional	RNs (54)	Survey	General Practices
Ladden et al., 2013	United States	To describe new roles played by members of primary care teams	Qualitative	25 practice sites	Direct Observations Photo documentation Staff/Patient Shadowing	General Practices
Leech et al., 2007	South Africa	To describe the responsibilities of CNs according to their legal scope of practice, with regard to the management of developmental needs of infants in primary health care clinics in South Africa	Case study	RNs (5) Managers (4) Speech therapist (1) Occupational therapist (1) Physiotherapist (1) Family/patient (6)	Semi-Structured Interviews Document Study	Government funded primary clinic
Lukewich et al., 2014	Canada	To determine the roles of RNs working in primary care settings in Ontario and the extent to which chronic disease management strategies have been implemented	Cross sectional	RNs (218) NP (73) RPN (16)	Survey Questionnaire	Family Health Teams Community Health Center GP office NP office General Practices (rural/urban)
Pascoe et al., 2005	Australia	To describe the workforce characteristics and current responsibilities of nurses working in Australian general practice settings	Mixed method	RNs (222)	Qualitative telephone interviews	General Practices (rural/urban)
Patterson et al., 1998	Australia	To describe the demographic and occupational characteristics of a sample of nurses employed by general medical practitioners	Mixed method	RNs (37) (Questionnaires) RNs (10) (Interviews)	Telephone/Mail Surveys Interviews	Medical practices (175) (Solo or Group)
Phillips et al., 2009	Australia	To describe the evolving roles of practice nurses in Australia and the impact on general practice function	Multimethod research (substudy 1: cross sectional; substudy 2: longitudinal)	Substudy 1: 25 practices Substudy 2: 7 practices	Direct Observation Photographs of workspaces Interviews	General Practices
Planas-Campmany et al., 2016	Spain	To analyze RN contributions to meeting primary health care objectives	Cross sectional	Primary Health Care Teams (350) Health Care Professionals (16,000) RNs (187)	National Mandatory Electronic Reporting	Primary Health Care Practices
Rondinelli et al., 2014	United States	To describe components of RN roles in ambulatory care settings	Mixed method		Survey	Primary care/specialty care clinics
Smolowitz et al., 2015	United States	To generate new information about the roles of RNs in primary health care	Qualitative	Practice representatives (16)	Open Ended Questions Telephone Interviews	Clinics; Academic networks; Hospital Affiliated Clinics; Community Health Centers; Physician Group Practices VA Health Care System (PACT)
Stewart et al., 2015	United States	To capture nurses' perception of patient aligned care teams' effect on their nursing practice and role identity as they transitioned to team-based model of care	Qualitative	RN (12) LPN (6)	Semi-structured interviews	Physician offices
Todd et al., 2007	Canada	To explore the current role of family practice/primary	Mixed method	41 Surveys 22 semi	Mail Surveys Telephone	Physician offices

(continued on next page)

Table 1 (continued)

Study	Country	Aim	Design	Sample	Measures	Setting Type
Walker et al., 2015	New Zealand	health care nurses in Nova Scotia To describe the different configurations of health professionals' skill-mix in three dissimilar primary care practices; their inter- and intra-professional collaboration and communication, and to explore the potential of expanded nursing scopes and roles to improve patient access	Mixed method	structured interview Key informants per site [RN, NP, EN, GP]	Interviews Document Review Observation Interviews	Family practice units GP-RN owned practice GP owned practice GP owned/NP & RN employed practice
Walsh et al., 2015	Australia	To examine roles and responsibilities of practice nurses in the area of health and development and in advising parents about child health issues	Cross sectional	RNs (159)	National Online Survey	General medical/practice Community based; specialists; Pediatric; Maternity

Note: PCMH, primary care medical home; RN, registered nurse; PN, practice nurse; EN, enrolled nurse; GP, general practitioner; NP, nurse practitioner; LPN, licensed practical nurse; RPN, registered practical nurse; VA, veterans affairs; PACT, patient aligned care team.

of tasks from the primary care provider (Planas-Campmany et al., 2016; Walker et al., 2015).

Across all of the studies the most common RN clinical responsibilities were: vaccinations (Anderson et al., 2012; Condon et al., 2000; Halcomb et al., 2008; Lukewich et al., 2014; Pascoe et al., 2005; Phillips et al., 2009; Planas-Campmany et al., 2016; Todd et al., 2007; Walsh et al., 2015) ear syringe irrigation (Anderson et al., 2012; Joyce and Piterman, 2011; Pascoe et al., 2005; Patterson et al., 1998; Todd et al., 2007; Walsh et al., 2015), dressing changes (Condon et al., 2000; Halcomb et al., 2008; Joyce and Piterman, 2011; Pascoe et al., 2005; Patterson et al., 1998), medication administration (Anderson et al., 2012; Halcomb et al., 2008; Joyce and Piterman, 2011; Patterson et al., 1998), removal of sutures (Pascoe et al., 2005; Patterson et al., 1998; Todd et al., 2007), venipuncture (Condon et al., 2000; Halcomb et al., 2008; Patterson et al., 1998), and first aid (Pascoe et al., 2005; Walker et al., 2015). Seven studies reported RN expertise in wound care as the task that was delegated to them by the primary care provider (Anderson et al., 2012; Condon et al., 2000; Halcomb et al., 2008; Joyce and Piterman, 2011; Lukewich et al., 2014; Phillips et al., 2009; Todd et al., 2007). In Australia, the primary care provider valued the wound care expertise of RNs, which resulted in more collaborative efforts between these clinicians to improve clinical wound outcomes (Condon et al., 2000). RNs also assisted the primary care providers with minor in-office procedures or diagnostic tests, such as setting up pre-intervention and monitoring the patients post-intervention (Walker et al., 2015).

All studies reported variability in the RN roles and responsibilities that included non-clinical tasks, such as answering phones and message management. In the US, one study reported that RNs answer 9–56 telephone messages in one shift (Rondinelli et al., 2014). In Canada, 40% of RNs reported lacking clear understanding about their job description and 24% reported practicing outside their scope of practice (Lukewich et al., 2014). In Australia, one study reported that RNs spend only 45% of their time with direct patient contact while the rest of the time was spent on non-nursing tasks, such as cleaning exam rooms (Phillips et al., 2009). In addition, RNs in Australia were the only nurses reported to be responsible for maintaining/updating policies and procedures, and assisting with research activities conducted in their practice environment (Condon et al., 2000; Halcomb et al., 2008; Pascoe et al., 2005). In the US, RNs were more likely to be responsible for quality assurance activities, such as chart audits (Anderson et al., 2012; Halcomb et al., 2008; Smolowitz et al., 2015). RNs in the US were also identified as the “go-to” person for solving problems throughout the office, such as locating lost files, overseeing the transfer of pathology specimens, or managing patient complaints (Anderson et al., 2012; Phillips et al., 2009). In addition, RNs in Australia, Canada, and the US reported that they performed non-nursing tasks such as billing, filing, booking appointments, restocking equipment, or doing reception duties (Anderson et al., 2012; Pascoe et al., 2005; Phillips et al., 2009; Todd et al., 2007). However, when the primary care team had a medical assistant or nurse's aide, that were responsible for completing the majority of these organizational tasks, RNs could assume more patient-centered clinical responsibilities (Ladden et al., 2013; Walker et al., 2015).

3.4. Chronic disease management

The findings from across all studies show that RNs play a large role in the management of chronic diseases. Hypertension and diabetes were the two most common chronic diseases for which care RNs were responsible for assessing, monitoring, and following up with patients (Anderson et al., 2012; Joyce and Piterman, 2011; Ladden et al., 2013; Lukewich et al., 2014; Pascoe et al., 2005; Planas-Campmany et al., 2016; Smolowitz et al., 2015; Stewart et al., 2015; Todd et al., 2007; Walker et al., 2015). The most frequent clinical tasks performed by RNs to manage these specific chronic diseases included checking blood pressure and vital signs (Joyce and Piterman, 2011; Lukewich et al.,

2014; Patterson et al., 1998), performing electrocardiograms (Anderson et al., 2012; Condon et al., 2000; Halcomb et al., 2008; Patterson et al., 1998; Phillips et al., 2009), adjusting insulin dosage (Anderson et al., 2012), completing diabetic foot exams (Anderson et al., 2012; Todd et al., 2007), measuring blood glucose levels (Patterson et al., 1998), and screening for diabetic retinopathy (Anderson et al., 2012). In Spain, RN chronic disease management focused on risk assessment; control and monitoring of risk factors. Asthma was the third most common chronic disease that RNs managed (Ladden et al., 2013; Lukewich et al., 2014; Pascoe et al., 2005; Patterson et al., 1998; Phillips et al., 2009; Walsh et al., 2015). More specifically, in Australia and Canada, RNs assessed asthma control with spirometry or peak flow testing (Condon et al., 2000; Halcomb et al., 2008; Lukewich et al., 2014; Patterson et al., 1998; Phillips et al., 2009), administered nebulizer treatments (Pascoe et al., 2005; Patterson et al., 1998), and provided asthma education (Lukewich et al., 2014; Pascoe et al., 2005; Patterson et al., 1998).

For all of the chronic diseases, it was evident that with the use of standardized clinical practice guidelines, RNs were able to identify patients with abnormal findings that required follow up and additional interventions (Lukewich et al., 2014; Smolowitz et al., 2015). For example, RN patient care in New Zealand was guided by robust policies, procedures and a sign off system. This resulted in RNs reporting that they had more independence and their practice was safer (Walker et al., 2015). Furthermore, in the US and Australia, patients with chronic disease that required extensive follow up with post-office or post-hospitalization visits were managed by RNs (Halcomb et al., 2008; Ladden et al., 2013; Phillips et al., 2009). In the US, follow-up visits occurred over the phone and RNs held the responsibility of reviewing specialist consultation reports (Ladden et al., 2013). Australian RNs were often delegated to reviewing diagnostic test results to determine what additional treatment plan was needed (Halcomb et al., 2008).

3.5. Case management and care coordination

RNs played a vital role across all six countries in helping to refer patients outside of the primary care environment when additional services or specialist consultation were required (Ladden et al., 2013; Leech et al., 2007; Lukewich et al., 2014; Rondinelli et al., 2014; Walker et al., 2015; Walsh et al., 2015). One study in Canada reported that 61% of RNs made independent patient referrals to home care, lactation specialists, social workers, dieticians, and occupational therapists (Todd et al., 2007). A second study showed that RNs in South Africa acted as the primary liaison for patient needs and referrals (Leech et al., 2007). RNs in the US were the only group of RNs reported to assess patients through telehealth, such as home blood pressure monitoring (Anderson et al., 2012; Stewart et al., 2015). Furthermore, RNs in the US, Canada, and Australia, were found to be effective in triaging patients over the phone, anticipating patient complications, and providing guidance that prevented unnecessary emergency visits (Anderson et al., 2012; Rondinelli et al., 2014; Smolowitz et al., 2015; Todd et al., 2007; Walsh et al., 2015). This active triaging over the phone also helped to alleviate receptionist or clerical stress, because RNs acted as the contact person for other health care providers (Phillips et al., 2009; Todd et al., 2007).

3.6. Pharmaceutical management

RNs play an essential role in the administration and management of medications. Eight studies reported that RNs performed medication management, such as the administration of oral or injectable medications during the patient visit (Anderson et al., 2012; Halcomb et al., 2008; Joyce and Piterman, 2011; Pascoe et al., 2005; Patterson et al., 1998; Rondinelli et al., 2014; Todd et al., 2007; Walker et al., 2015). Almost 92% of RNs in one of the studies, reported injecting medications as part of their primary job function (Todd et al., 2007). The use of

existing protocol and practice guidelines enabled RNs to adjust dosages of medications independently (Lukewich et al., 2014), including insulin for diabetic control (Anderson et al., 2012), and warfarin to prevent the formation of blood clots (Walker et al., 2015). In the US alone, it was evident that RNs played a role in assisting the primary care provider with maintaining the pharmaceutical demands of patients, such as having the responsibility of refilling common prescriptions (Anderson et al., 2012; Ladden et al., 2013).

3.7. RN role specific to pediatrics and women's health

Seven studies conducted in the US, Spain, South Africa, and Australia reported RN roles and responsibilities in the care of pediatric populations (Anderson et al., 2012; Leech et al., 2007; Pascoe et al., 2005; Patterson et al., 1998; Planas-Campmany et al., 2016; Rondinelli et al., 2014; Walsh et al., 2015). Primarily, RNs were responsible for newborn and infant developmental assessments (Anderson et al., 2012; Leech et al., 2007; Pascoe et al., 2005; Patterson et al., 1998; Planas-Campmany et al., 2016; Walsh et al., 2015). In one South African primary care clinic, RNs were the sole healthcare provider responsible for the identification of, and interventions for, infant developmental delays (Leech et al., 2007). In Spain, RNs assess children for obesity and perform preventative interventions and risk assessment (Planas-Campmany et al., 2016). Additional tasks during clinical RN visits with children included audiometry assessments, lead screenings, and acting as the team liaison (Anderson et al., 2012; Pascoe et al., 2005). RNs across studies also played a vital role in maternal education specific to providing advice on lactation or feeding (Pascoe et al., 2005; Walsh et al., 2015), how to care for a child with a high fever (Walsh et al., 2015), the identification of, or support with, pediatric developmental delays (Leech et al., 2007), and addressing parental inquiries about a change in a child's behavior pattern that raised parental concern (Walsh et al., 2015).

In the US and Australia, RNs also played an important role addressing care aspects specific to women's health, yet Australian RNs were reported to hold more responsibility than US RNs. More specifically, Australian RNs conducted pre- or post-natal exams (Joyce and Piterman, 2011; Pascoe et al., 2005; Patterson et al., 1998; Walsh et al., 2015), screening measures, such as cervical PAP smears, and clinical breast exams (Joyce and Piterman, 2011; Patterson et al., 1998; Phillips et al., 2009); while US RNs only performed pregnancy tests (Anderson et al., 2012). Fig. 2 demonstrates a comparison of reported RN roles and responsibilities across countries.

4. Discussion

This review synthesizes existing international evidence on the roles and responsibilities of RNs in primary care across six countries: Australia, US, Canada, New Zealand, Spain, and South Africa. All studies were available in the English language and all studies met quality standards for eligibility in this review. The findings show that within a team infrastructure, RNs predominantly hold the responsibility of clinical nursing care such as medication administration, wound care management, assisting with procedures, screening, risk assessment, and patient education. In Spain alone, one-third of national primary care objectives were influenced by RN primary care responsibilities (Planas-Campmany et al., 2016). This highlights the potential of RNs in meeting primary care objectives. It is evident that RNs play a vital role in chronic disease management of patients with diabetes and hypertension, and have critical roles in control and monitoring risk factors, as well as assessing the effect of treatments and medications (Planas-Campmany et al., 2016; Rondinelli et al., 2014). This is achieved by addressing the patient concerns over the phone, which either prevents unnecessary patient visits or alerts the primary care provider to complications that require more attention. RNs also often shift between clinical and administrative tasks. This multitasking can be beneficial for

Fig. 2. Number of studies reporting RN roles and responsibilities.

	Australia (n=8)	United States (n=5)	Canada (n=2)	New Zealand (n=1)	Spain (n=1)	South Africa (n=1)
Responsibilities Within Team						
Clinical Patient Care	7	3	2	1	1	1
Policy Maintenance	3					
Research	3					
Quality Assurance	1	1				
Patient Complaints	1	1				
RN managed visit	1	1		1		
Team Liaison		1	1			1
Chronic Disease Management						
All Diagnoses	6	3	2			
Diabetes	3	2	2		1	
Hypertension	5	1	2		1	
Asthma	5	1	2			
Education	6	3	2		1	1
Follow-up	2	1			1	
Care Coordination						
Patient Referral	1	1	2	1		1
Community Liaison						1
Telehealth		2				
Triage	2	3				
Pharmaceutical Management						
Medication Administration	4	1	1	1		
Dosage Adjustment	1	1	1	1		
Medication Refill		2				
Pediatrics & Women's Health						
Pediatrics (Overall)	4	1			1	1
Newborn Assessments	4	1				1
Maternal Education	4	1			1	1
Women's health (Overall)	5	1				1
Pre/Post-natal exams	2					
Cervical Cancer screenings (PAP)	1					
Clinical Breast Exams	1					
Pregnancy Tests		1				

organizations as RNs can reduce the primary care provider workload by taking care of adjunct clinical care, administrative tasks, addressing patient complaints, managing equipment and supplies, and overseeing the transfer of lab specimens. However, if majority of RN responsibilities fall within non-nursing tasks, there is a misuse of their clinical expertise.

Based on our findings we have three recommendations about how to improve RN utilization in primary care practice. First, integrating RNs into primary care has the potential to increase patient access to a primary care provider, because RNs can supplement some of the primary care provider workload: they renew prescriptions, address patient questions, and provide patient education. When RNs manage adjunct clinical and administrative tasks, the primary care provider workload is reduced and there is more time left for additional provider-patient visits or interactions (Jansen, 2008; Wilkinson, 2015). When physicians delegate some of their traditional clinical tasks, such as immunizations, RNs are able to act as both a complement and supplement to the primary care provider role (Joyce and Piterman, 2011). Clinical tasks include triage of patients prior to the visit, performing point of care testing such as EKGs and spirometry; vaccinations or routine injections; performing patient education related to medications, disease management, and health promotion; and follow up to ensure care plan compliance or clarify patient questions. In New Zealand, RNs complement and supplement roles through clearly delineated practice guidelines and protocols that help RNs to deliver evidence-based and safe patient care (Wilkinson, 2015). For example, with standing orders, a RN can see a patient to administer a vaccination without the presence of a physician. This will free up additional time and appointments for the

primary care provider to see other patients. Examples of RN administrative tasks include care coordination, connecting patients with community-based resources, quality assurance monitoring, performing research within the practice, completing requested patient forms and ensuring documentation is up to date.

Second, it is important that RNs take an active role in the creation and maintenance of nursing practice policy that defines their roles and responsibilities in primary care. We recommend that when integrating RNs into primary care, clear protocols and policies be written to guide RN responsibilities. Policymaking by those who are not familiar with RN skills and training may result in an underutilization of RNs in primary care. Surprisingly, in this review, Australian RNs were the only nurses that reported active RN policy maintenance or RNs conducting research in the primary care setting.

Third, integrating RNs into a primary care team does not replace the need for a medical assistant or clerical staff. When RNs are tasked with too many administrative and non-clinical responsibilities, such as cleaning and preparing exam rooms, or answering phone calls, it inhibits their productivity potential to manage more complex patient care that is supported by their education and training. These tasks can be effectively completed by receptionists or medical assistants thus allowing RNs to devote time to patient care management that is within their scope of practice. Practice managers should understand that underutilization of RNs, when they spend 55% of their time performing non-nursing tasks, is an inefficient use of RNs' advanced skills and competencies that should be used in direct patients' care. Wise use of clerical personnel will allow RNs to fully use their clinical skill and work with patients, thereby alleviating provider strain (Ladden et al.,

2013).

It is important to illuminate what additional research is warranted. First, while the findings in this review demonstrate RN contributions to screening, health promotion and individual chronic disease management, their impact on multimorbidity management remains unclear. There are no current practice guidelines to manage patients with multiple co-morbidities and are often based on individual chronic-disease-specific recommendations. As more and more patients are presenting with multiple co-morbidities, patient care management will increase in complexity. Future research and policy analysis surrounding multimorbidity and practice guidelines are recommended to determine how to best utilize RNs. Second, it is important to note that the integration of RNs into primary care practices is often economically driven. For example, one of our included studies identified that practices were hesitant to hire RNs due to funding arrangements (Condon et al., 2000). However, there are no current studies that have explored the cost-benefit or cost-effectiveness of adding RNs as an additional hierarchical tier to primary care teams. Addressing specific payment modalities for RN services provided in primary care was out of the scope of this paper. Payment models differ across countries thus making it difficult to formulate universal recommendations about how to pay practices for the time RNs spend in patient care. Team-based payment models have emerged but there is variability in health care costs across primary care settings (e.g. US medical homes) (Martsolf et al., 2016). We recommend that emerging payment models, specific to individual countries, continue to be investigated to determine how to effectively reimburse practices for RN- and team-based primary care.

5. Limitations

This review has limitations. The combination of diverse study designs and methodologies of the included studies produces a complexity that potentiates bias. However, to gain a comprehensive understanding of the roles and responsibilities of RNs, this review offers the opportunity to examine variability across multiple settings useful for advocacy and the advancement of RN-based patient care in primary care practices. Also, the literature search, although systematic, may have been incomplete. In an effort to alleviate some of this search bias, consistent search terms, hand searches of reference lists, and performing a search for gray literature was conducted. Finally, the findings of this review are based on RN roles and responsibilities strictly stemming from the included studies and may not be representative of all RN clinical and administrative tasks in every primary care organization. The variability of RN policy across countries, practices and organizations creates a difficulty in summarizing a universal scope of RN practice in primary care. The findings in this review, however, will allow policymakers and researchers to understand the overall potential of integrating RNs into primary care teams. It also provides RNs with evidence of the best way to utilize their skills and education needed to provide optimal patient care.

6. Conclusion

As health care organizations are moving toward team-based care delivery models to meet the needs of patients in primary care, it is crucial to effectively utilize all available primary care workforce resources, including RNs, to meet the demands of high quality patient care. This review provides evidence of current roles and responsibilities of RNs in primary care settings across six countries. When clear practice protocols and nursing policy is used to guide nursing practice, embedding RNs into primary care teams has the potential to increase patient access to primary care services and alleviate organizational workload. RNs need to increase their involvement in policymaking and research surrounding primary care to promote their effective utilization. Furthermore, it is recommended that multimorbidity RN practice guidelines, and also payment models, that include RN-specific tasks, be

further investigated.

Conflict of interest

The authors declare that there is no conflict of interest.

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