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REVIEW

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Effects of task-shifting from primary care physicians to nurses: an overview of systematic reviews

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Abstract

Background Task-shifting from primary care physicians (PCPs) to nurses is a means of overcoming PCP shortages and meeting the needs of patients receiving primary care. The aim of this overview of systematic reviews is to assess the effects of delegation or substitution of PCPs' activities by nurses on patient relevant, clinical, professional and health services-related outcomes.

Methods We conducted a systematic literature search for secondary literature in Medline, Embase, Pubmed, the Cochrane Library, and the Cumulative Index of Nursing and Allied Health Literature (CINAHL). We included systematic reviews and meta-analyses that analysed randomised controlled trials (RCTs) and controlled, prospective trials in English and German. Abstracts and full-text articles were screened independently by two reviewers. Full-text articles were assessed using the Overview Quality Assessment Questionnaire. After data extraction a narrative synthesis was performed. We defined patient-relevant outcomes as our primary outcomes.

Results We included six systematic reviews. The interventions included first contact, history taking and assessment, patient education, review of drug treatment, referrals to GPs and other health professionals, ordering further investigations and ongoing care.

Two meta-analyses showed a relative risk reduction of mortality in favour of nurse-led care, whereby the reduction in one analysis was significant. The effect was highest in the group of more highly qualified nurse practitioners (RR 0.19), as opposed to nurse practitioners (RR 0.76) and registered nurses (RR 0.92). Two meta-analyses showed a relative risk reduction in hospital admissions and patient satisfaction. Whereas care conducted by physicians and registered nurses led to the same outcomes, care conducted by nurse practitioners led to better outcomes (RR 0.74). An analysis according to nursing group showed that patients were more satisfied with treatment by registered nurses (SMD 1.37) than with treatment conducted by nurse practitioners and more qualified nurse practitioners (SMD 0.17). In terms of patient-relevant outcomes, no differences were observed between physician-led care and nurse-led care in terms of physical function, quality of life and pain.

Conclusion Nurse-led care is probably as safe or safer than physician-led care in terms of mortality and hospital admissions. However, the impact of nursing staff training has not been sufficiently examined.

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Keywords Systematic reviews, Nurses, General practitioners, General practice, Primary care, Primary health care, Primary care nursing, Patient satisfaction, Nurses' role, Primary care physician

Background

Reacting to staff shortages by reorganising healthcare services and shifting responsibilities from primary care physicians to nurses results in changes to the skill mix. As the first port of call for most patients, primary care is of great importance, as it acts as a guide and coordinator in the healthcare system [1]. It also helps to empower patients and provides long-term care for the chronically ill [2]. Furthermore, there is a correlation between the quality of primary care and the health outcomes of patients. [3].

A total of 17 European countries, including Norway, have reported a shortage of medical doctors [4]. In many other OECD (Organization for Economic Cooperation and Development) countries, a shortage of medical doctors, particularly general practitioners and doctors in rural areas, is a cause of concern. Medical professionals are frequently highly concentrated in and around major cities (e.g. Austria, the Czech Republic, Denmark, Greece, Hungary, Portugal, the Slovak Republic, and the United States) [5]. The potential scarcity of PCPs (primary care physicians) may make it difficult for certain countries to maintain high-quality primary care and ensure comprehensive coverage across all regions. This presents a significant challenge in regions where the recruitment of suitable candidates is particularly difficult, such as rural areas [6, 7]. A simulation conducted by the World Health Organization (WHO) in 2017 [8] showed different health workforce scenarios for various countries. The simulation indicated that certain countries, such as Austria, Hungary, Japan, the Republic of Korea, Slovakia, and Slovenia, may experience a surplus of nurses but a shortage of physicians, while other countries like the U.S. may experience a shortage of both professions. Forecasts show an expected shortage of between 17,800 and 48,000 primary care physicians in the U.S. by 2034 [9]. Nevertheless, actual developments are of course uncertain, as the simulations are based on a number of assumptions [8]. Moreover, many countries are taking measures to counteract these challenges, and further measures that may yet be adopted have been recommended [6, 10].

Nurses represent the largest group of healthcare professionals in the majority of healthcare systems [11–13]. The role of nurses encompasses a wide range of activities, including health promotion, disease prevention, and the care of individuals and disabled patients with physical and mental illnesses, whereby health care is delivered in both inpatient and outpatient settings [14].

Although physicians and nurses are two distinct professions with different roots and philosophical backgrounds [15], task-shifting from PCPs to nurses is a possible means of overcoming a shortage of PCPs and better and more efficiently meeting the needs of populations in the primary care setting. The training of doctors and nurses is fundamentally very different. While the former complete a long theoretical study before the actual training, nurses usually start with practice-oriented training straight away.

Nursing is a profession that promotes self-care [16] by encouraging patients to independently perform activities that contribute to improving their health or helping in their recovery [14]. It is therefore similar to some aspects of the WONCA (World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians) definition of general practice [2]. Despite being distinct professions, certain aspects of primary care nursing and general practice are common to both. Nevertheless, a more comprehensive nursing role requires also the assumption of greater responsibility.

The role of nurses in primary care varies considerably across different countries. A report published by the WHO analysed 40 European countries in terms of their primary care and professional groups. In 17 countries, nurses worked in primary care settings. However, the report did not specify whether nurses worked directly in general practices, or as community or home care nurses [17]. In Great Britain, general practice nurses work on different levels, including as practitioners, advanced nurse practitioners, and consultant practitioners. Typically, they hold a bachelor's degree and have received special training in general practice. Depending on the level, nurses play an important role in primary care, and have a wide range of such responsibilities as the promotion of healthy lifestyles, implementing vaccination programmes, and performing diagnostic procedures such as electrocardiograms and spirometries. They are also involved in therapeutic procedures such as wound care, cannulation of venous lines, prescription of medications, and in following up on patients with chronic pathologies [18–21].

Two main professional nursing groups play an active role in a primary care setting: practice nurses (or primary

(health) care nurses) who primarily support general practitioners and hold a bachelor`s degree, and advanced nurse practitioners, who are more highly qualified and usually have the equivalent of a master's degree. They may also stand in for GPs [22].

Previous systematic reviews have demonstrated that nurses performing tasks normally carried out by PCPs may result in improved outcomes [23, 24]. The assessed interventions include preventative and curative measures, urgent consultations, and the treatment of patients with chronic conditions. The evidence is of low-to-moderate quality [23]. Overviews of systematic reviews on similar topics have also been published. However, they focused on more occupational groups that are more obviously suited to task-shifting and the methods used were more open to different study designs [25]. In addition, the definition of the primary care setting was broader [25, 26].

There is a need for a comprehensive review of the efficacy of preventive, curative, rehabilitative, and palliative interventions in primary care, particularly those provided by nurses substituting for PCPs. This review will utilise a rigorous methodology that includes prospective controlled trials, and report the results as comprehensively as possible, so that decision-makers in different health care systems can make decisions based on a high level of evidence. Furthermore, there is a paucity of information on the educational background of nurses that substitute for PCPs. It is unclear whether the education of general practice nurses is mostly academic, with participants obtaining a bachelor's, master's or doctoral degree, or whether it is specific, non-academic training. It is also unclear whether and to what extent qualifying as a general practice nurse involves practical training.

Aim and review questions

The aim of this overview of systematic reviews is to assess the effects of delegation or substitution of PCPs' activities by nurses on patient-relevant, clinical, professional and health services-related outcomes, and to provide an overview of all primary care tasks that can be performed by nurses.

The review questions are:

1. Which tasks and complex interventions usually carried out by PCPs are delegated to or substituted by nurses?
2. What are the effects of delegation or substitution by nurses of PCPs' tasks and interventions compared to routine care provided by PCPs regarding
- Patient-relevant outcomes,
- Clinical surrogate outcomes,
- Professional outcomes and
- Health services-related outcomes?
3. In the trials, what qualifications did nurses to whom tasks were delegated have?

Methods

Protocol, registration and ethics

We performed an umbrella review. According to the Cochrane Handbook [27], the phases of an umbrella review should encompass the following phases: defining the research question(s) and criteria for including systematic reviews, managing overlapping systematic reviews, searching for systematic reviews and selecting systematic reviews, assessing primary study overlap of included reviews, assessing methodological quality of systematic reviews, analysing and presenting data from systematic reviews.

The study protocol was registered on Prospero (Prospero Registration Number: CRD42020183327; https://www.crd.york.ac.uk/PROSPERO) and published elsewhere [28]. We started initial work on the review in July 2020. Due to staffing constraints, we were unable to complete the review in 2020, but started an update search again in 2023 and completed the work in June 2024. The methods are therefore reported here in summary form. This review does not require ethics committee approval because it is based on published studies.

Search strategy

The following databases were searched: Medline, Embase, Pubmed, the Cochrane Library, and the Cumulative Index of Nursing and Allied Health Literature (CINAHL). Selected terms related to the topics "nursing", "substitution", "delegation" and "primary care" were applied using Medical Subject Headings (MeSH) and free text words. Date of the last search was June 23, 2023. The full search strategy is available in the supplement of the published protocol [28].

Inclusion criteria

We included systematic reviews and meta-analyses that analysed randomised controlled trials (RCTs) and controlled, prospective trials in English and German. Patients had to have been treated in a primary care setting. The intervention had to be a medical task performed by a nurse and the control had to be a primary care physician (general practitioner, paediatrist, geriatrist, general internist) that performed the same medical task as the nurse in the intervention group. In cases where the task can be performed by both professional groups, e.g. prescribing medication, it was defined as a medical task. Outcomes of interest were: clinical surrogate outcomes (e.g. blood pressure levels), patient-relevant outcomes

(e.g. satisfaction), professional outcomes (e.g. job satisfaction), health services-related outcomes (e.g. costs).

Screening

Abstracts and full-text articles were screened independently by two reviewers (MPA, NP, NPL, TS) for at least one-third of all potentially relevant full-text articles. In case of disagreement or uncertainty, consensus was reached through discussion, or a third reviewer was consulted.

Quality assessment

Methodological quality was assessed using the Overview Quality Assessment Questionnaire (OQAQ) which is a measurement instrument that was designed to assess the scientific quality of published review articles and comprises a set of criteria, e.g. whether selection criteria was reported and selection bias was avoided [29, 30]. Five or more out of seven possible points indicate minor or minimal flaws [30]. Only reviews scoring 5 or more points were included in the data synthesis.

Data extraction

The extraction table comprised predefined characteristics as reported in the protocol [28]. Data were extracted according to a structured extraction table that was piloted on two relevant studies to ensure applicability and was adapted afterwards.

One reviewer extracted the data and a second reviewer checked or corrected the extracted data. In addition, for some aspects, such as training of nursing staff, data were extracted from primary studies if the included reviews did not contain sufficient information.

Data synthesis and analysis

The data synthesis was performed as a narrative synthesis. The primary outcomes in our overview were patient-relevant outcomes.

As this overview of systematic reviews includes reviews that partly use the same primary studies, we analysed the overlap of systematic reviews. We used a citation matrix to show the overlap in the included reviews and calculated the covered area (CA) and the corrected covered area (CCA) as a measure of the degree of overlap. For the interpretation of the CCA, we followed Pieper's suggestion [31]: CCA 0–5 (low), 6–10 (moderate), 11–15 (high), > 15 (very high).

Results

Study selection

After removing duplicates, the systematic literature search identified 3281 records in five databases. Through abstract screening, we excluded 3172 titles and abstracts of all identified records. The remaining 109 full-text articles were assessed for eligibility, 103 reports were excluded because of 12 different reasons. Of the 103 reports, there were 5 reports that received less than 5 points in the in the OQAQ rating (reason 11) [32–36]. Finally, we included six systematic reviews in this overview of systematic reviews [23, 24, 37–40]. The study selection process is presented in a PRISMA flow diagram (Fig. 1) [41]. The reasons for the exclusion of the full-texts can be found in Additional File 1: Full-text articles with reason for exclusion (Additional File 1).

Characteristics and quality of the included reviews

Table 1 shows the characteristics of the included systematic reviews and their OQAQ scores. The six reviews were published from 2014 to 2018. Of the six reviews, five are from the same group of authors [24, 37–40], while the other is a Cochrane Review [23] carried out by the Cochrane Effective Practice and Organisation of Care Group. No review concentrated on a specific patient group except one, which focused on chronically ill patients [24]. Moreover, all the reviews included both males and females. One excluded patients with mental health problems [23], while three explicitly mentioned that they included such patients [24, 39]. All included reviews achieved an OQAQ score of seven, which is the highest possible score. Four of the six systematic reviews conducted meta-analyses [23, 37–39].

Included primary studies in the reviews and overlap of reviews

Characteristics. The reviews included between 11 [39, 40] and 24 RCTs [37], or a total of 32 studies overall. The primary studies were published in 50 papers from 1967 to 2016, with a strong increase in research interest noticeable in the 2000s. The primary studies were conducted in Canada (2), The Netherlands (6), Russia (1), Spain (1), South Africa (2), Sweden (1), the UK (13) and the U.S. (6). Overall, 41% were carried out in the UK, and 19% each in the Netherlands and the U.S.

Overlap. To show the overlap between the reviews of included primary studies, we created a citation matrix (see Fig. 2: citation matrix) and calculated the covered area (CA) and corrected covered area (CCA). The covered area (CA) of the reviews was 49%, and the corrected covered area (CCA) 39%. As one first author published five systematic reviews that were likely to have been based on the same search criteria, we calculated the CA and CCA a second time, counting all five reviews [24, 37–40] as one. This resulted in a similar CA of 64% and a lower CCA of 28%, implying that these five reviews had considerable overlap. Pieper et al. [31]

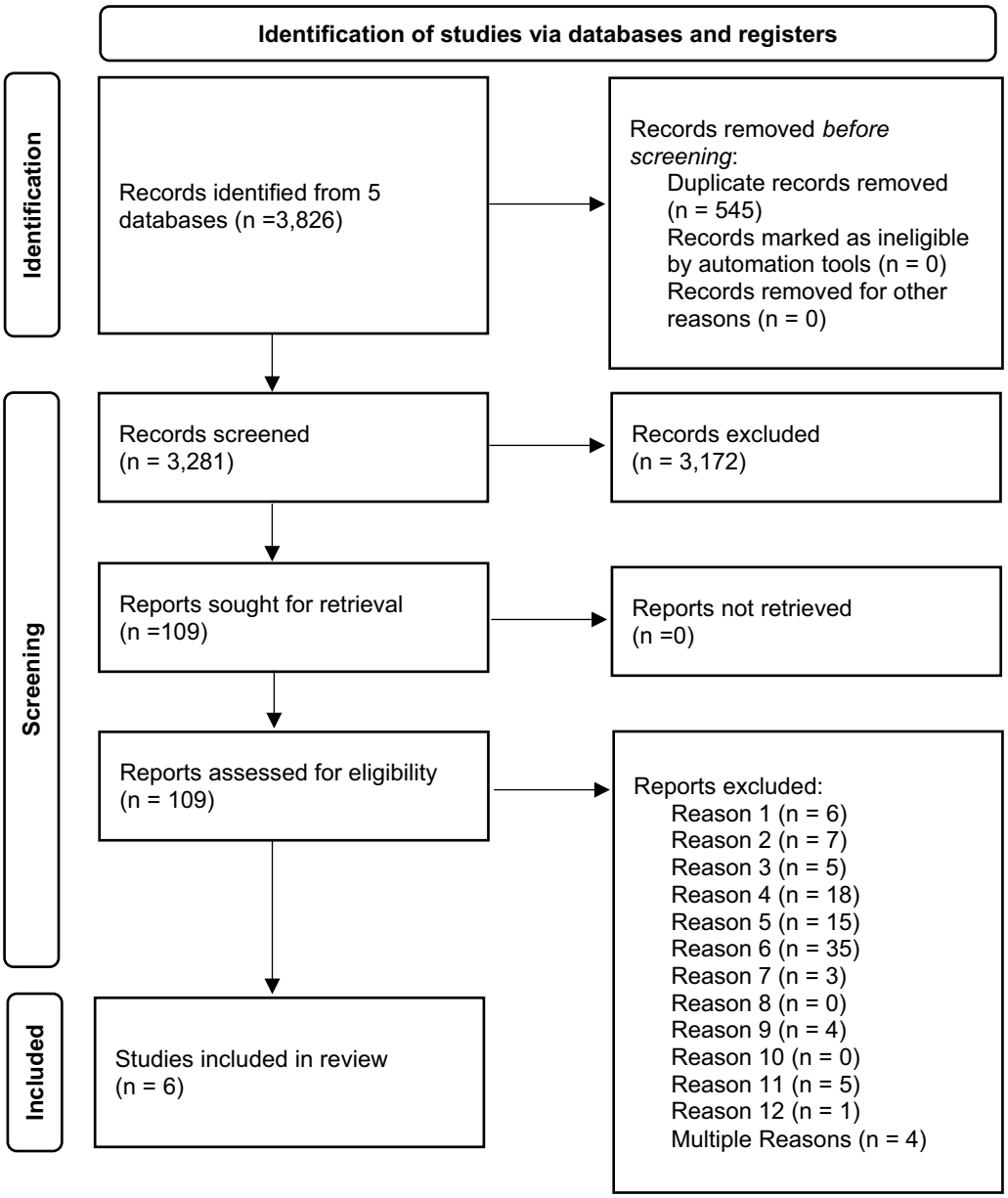

Fig. 1 Flowchart for the study selection process. Reason 1: no secondary literature (e.g. primary or tertiary literature, editorial, letter); Reason 2: no systematic review, HTA report; meta-analysis; Reason 3: systematic review/ HTA report/ meta-analysis does not contain (separated) results from RCTs or controlled prospective trials; Reason 4: tasks or interventions are not done in primary care setting or no separated results for the primary care setting; Reason 5: the interventions assessed is not a medical intervention substituted by nurses (e.g. no medical intervention, traditional nursing intervention); Reason 6: intervention in the control group is not a medical intervention executed by doctors (services in the intervention and control group must be the same, no additional services); Reason 7: no patient-relevant outcomes (e.g. hospital admissions, patient satisfaction, mortality, morbidity), clinical surrogate parameters (e.g. blood pressure, HbA1c, …), health care system-relevant outcomes (e.g. costs) assessed/reported; Reason 8: language is not English or German; Reason 9: no full text publication in line with PRISMA statement, Reason 10: no human study; Reason 11: OQAQ (Overview Quality Assessment Questionnaire) rating < 5; Reason 12: duplicate, more recent version available

suggest that a CCA value of more than 15% can be interpreted as very high.

The citation matrix (Fig. 2) shows the number of times each study was included. Houweling [42] was included in all the reviews, followed by four primary studies [43–46] which were included in five.

Study population. The sample sizes ranged from very small (n = 50) [47] to very large (n = 20,990) [48].

Table 1 Characteristics of included reviews

Review First author Title *Journal*	Sponsor	Inclusion and exclusion criteria	Search information (databases, period)	Number of relevant studies included	OQAQ
Martinez-Gonzalez [39] Effects of Physician Nurse Substitution on Clinical Parameters: A Systematic Review and Meta-Analysis *Plos One*	Health Services Research Fund (Bangerter foundation) and Swiss Association of Family Physicians (Hausärzte Schweiz)	Design: RCTs Language: English Population: patients of all ages seeking first contact or undergoing care for all conditions including mental health and addiction Intervention: comparison between nurses and doctors (GP, paediatricians, geriatricians) Setting: primary care Outcome: clinical parameters	MEDLINE, EMBASE, Cochrane database, CINAHL Period: all available data up to Aug 2012	11 RCTs	7
Martinez-Gonzalez [37] Substitution of physicians by nurses in primary care: a systematic review and meta-analysis *BMC Health Serv Res*	Health Services Research Fund (Bangerter foundation) Swiss Association of Family Physicians (Hausärzte Schweiz)	Design: RCTs Language: English Population: patients of all ages seeking care for all conditions including mental health and addiction restricted to primary care Intervention: comparison between nurses and doctors (GP, paediatricians, geriatricians) Setting: primary care Outcome: clinical effectiveness and costs	MEDLINE, EMBASE, Cochrane database, CINAHL Period: all available data up to Aug 2012	24 RCTs	7
Martinez-Gonzalez [24] The effect of physician–nurse substitution in primary care in chronic diseases: a systematic review *Swiss Med Wkly*	Health Services Research Fund (Bangerter foundation) Swiss Association of Family Physicians (Hausärzte Schweiz)	Design: RCTs Language: English Population: populations of all ages and all conditions including mental health and addiction restricted to primary care Intervention: comparison between nurses and doctors (GP, paediatricians, geriatricians) Setting: primary care Outcome: process of care outcomes	MEDLINE, EMBASE, Cochrane database, CINAHL Period: all available data up to Aug 2012	14 RCTs	7
Martinez-Gonzalez [38] Task-shifting from physicians to nurses in primary care and its impact on resource utilisation: A systematic review and meta-analysis of randomised controlled trials *Med Care Res Rev*	Health Services Research Fund (Bangerter foundation) Swiss Association of Family Physicians (Hausärzte Schweiz)	Design: RCTs Language: English Population: patients of all ages and medical conditions Intervention: comparison between nurses and doctors (GP, paediatricians, geriatricians) Setting: primary care Outcome: population's use of health care resources including clinicians' resources	MEDLINE, EMBASE, Cochrane database, CINAHL Period: all available dates up to August 2012, updated in February 2014	18 RCTs	7

Table 1 (continued)

Review First author Title *Journal*	Sponsor	Inclusion and exclusion criteria	Search information (databases, period)	Number of relevant studies included	OQAQ
Martinez-Gonzalez [40] The impact of physician–nurse task-shifting in primary care on the course of disease: a systematic review *Hum Resour Health*	Health Services Research Fund (Bangerter foundation) Swiss Association of Family Physicians (Hausärzte Schweiz)	Design: RCTs Language: English Population: patients of all ages and medical conditions Intervention: comparison between nurses and doctors (GP, paediatricians, geriatricians) Setting: primary care Outcome: outcome measures related to the course of the diseases including symptoms, severity and complications	MEDLINE, EMBASE, Cochrane database, CINAHL Period: all available data up to August 2012, updated in February 2014	11 RCTs	7
Laurant [23] Nurses as substitutes for doctors in primary care (Review) *Cochrane Db Syst Rev*	Centre for Quality of Care Research (WOK), University of Nijmegen, Netherlands National Primary Care Research and Development Centre (NPCRDC), University of Manchester, UK Ministry of Health, Welfare and Sports, Netherlands Department of Health, UK	Design: randomised trials Language: English or Dutch Population: patients seeking first contact and/or ongoing care for patients with all types of health problems, excluding mental health problems Intervention: nurses (nurse practitioners, clinical nurse specialists, advanced practice nurses, practice nurses, health visitors, …) working as substitutes for doctors (GP, FD, paediatricians, general internists, geriatricians) Setting: Primary Health Care Services Outcome: patient outcomes, process of care outcomes, utilisation outcomes, costs	MEDLINE, CINAHL, EMBASE, Social Science and Citation Indexes, British Nursing Index, HMIC, EPOC Register CENTRAL, ICTRP, Clinical Trials.gov trial registries Grey literature Report, Open Grey, reference search Period: Update search up to Feb. /March 2017 in CENTRAL, MEDLINE and CINAHL; reference search in 2015	18 RCTs	7

CENTRAL: Cochrane Central Register of Controlled Trials; GP: general practitioner; FD: family doctors; ICTRP: International Clinical Trials Registry Platform; OQAQ: Overview Quality Assessment Questionnaire; RCT: randomised controlled trial

Primary Studies \ Included Reviews	Laurant 2018 (Cochrane Review)	Martinez-Gonzalez 2015 (Swiss Med Weekly)	Martinez-Gonzalez 2015 (Med Care Res Rev)	Martinez-Gonzalez 2015 (Hum Resour Health)	Martinez-Gonzalez 2014 (BMC Health Serv Res)	Martinez-Gonzalez 2014 (Plos One)	No. of times the primary study was included
Andryukhin 2010		x		x	x	x	4
Campbell 1998		x	x	x	x		4
Campbell 2014	x						1
Chambers 1978	x						1
Chan 2009	x	x	x	x	x		5
Denver 2003		x	x	x	x	x	5
Dierick van Daele 2009	x	x	x	x	x		5
Du Moulin 2007					x	x	2
Fairall 2012				x	x	x	3
Flynn 1974		x	x		x		3
Hemani 1999	x		x		x		3
Hesselink 2004		x	x	x	x		4
Hiss 2007			x		x	x	3
Houwelling 2011	x	x	x	x	x	x	6
Iglesias 2013	x						1
Jarman 2002		x	x		x	x	4
Kernick 2000			x	x	x		3
Kernick 2002			x		x		2
Kinnersley 2000		x	x	x	x		4
Kuethe 2011		x	x		x	x	4
Larsson 2014	x						1
Lattimer 1998	x						1
Lewis 1967	x	x	x		x		4
Moher 2001	x						1
Mundinger 2000	x		x		x	x	4
Ndosi 2014	x						1
Sanne 2010	x						1
Shum 2000	x	x	x	x	x		5
Spitzer 1973	x						1
Venning 2000	x		x		x		3
Voogdt-Pruis 2010	x	x			x	x	4
Winter 1981					x		1
No of primary studies included	**14**	**18**	**11**	**11**	**23**	**10**	

Legend: No. Number.
The green bar shows the number of reviews that included the primary study. The red bar shows the number of reviews that not included the primary study.

Fig. 2 Citation matrix

Overall, the primary studies accounted for a total of 79,588 patients (mean 2,411; median 812). Of the 32 studies, 15 (47%) had sample sizes > 1000 patients.

Twenty-five studies addressed patients that required chronic and ongoing care, and 13 addressed patients requiring acute care. In six studies, nurses treated both, chronic and acute care patients [47, 49–53]. Chronic care patients were usually adults with a specific chronic disease such as asthma, chronic fatigue syndrome/myalgic encephalitis, chronic heart failure, chronic inflammatory arthritis, chronic obstructive pulmonary disease, coronary heart disease, dyspepsia, eczema or psoriasis, HIV infections, hypertension, Parkinson's disease, type 2 diabetes, urinary incontinence or venereal disease. Only one study addressed children with stable asthma [54]. In acute care studies, patients were either included if they were seeking a same-day consultation without a specific condition, or if they visited the practice without focusing on a specific illness. Some studies included all primary care patients without confining them to specific illnesses [49–53, 55].

Interventions. The interventions comprised:

- First contact and triage [45, 48, 49, 53, 56–58]
- History taking, assessment and physical examination [46, 47, 59–64]
- Patient education and information, counselling, advice [44, 46, 48, 50, 58, 60, 61, 63, 65–68]
- Review of drug treatment [59, 60, 62, 69]
- Prescribing—in many cases supervised or signed off by doctors [42, 44, 46, 50, 61–63, 69, 70]
- Referrals to GPs and other health professionals [44, 52, 64, 71]
- Arranging further investigations such as blood tests or X rays [42, 50, 63]
- Ongoing care [43, 49, 53–55, 61, 72, 73].

Twenty-one studies reported that nurses used guidelines, protocols or a decision support tool, whereas in 11 studies their use was not mentioned [45, 46, 49, 51–53, 57, 67, 68, 70, 73].

Ten studies reported relying on physicians or other professions as supervisors for questions and/or medication prescriptions [46, 51, 54, 56, 57, 61, 62, 64, 68, 70], four studies reported having no supervisors [42, 52, 58, 74] and in 18 studies it remained unclear, whether supervision was provided.

The follow-up period ranged from 7 days [58] to 2.5 years [73]. The mean follow-up period was 10.5 months (SD 7.9 months), and the median 12 months. The follow-up period was ≥ 12 months in 59% (20/34) of the studies.

Nurses' training. Nurses performed the interventions in 24 studies, while the assessed interventions were carried out by nurse practitioners in 8 [43, 45, 51–53, 57, 63, 70].

The description of the nurses varied: registered nurse, practice nurse, district nurse, nurse clinician, nurse specialist, primary health care nurse, hypertension nurse, continence nurse, diabetes nurse, etc. They usually had specific training in the intervention they were required to deliver. Only five studies reported the duration of the training [42, 46, 49, 58, 74]. The nurses in these five studies had been trained for between 1 week [42] and nine months [49]. One study reported on primary health care nurses with 1 year of training and additional specialised training for the intervention [73]. The trainings were referred to as workshops, (clinical/ specialised/ structured) training, education programmes, courses or qualifications. Nothing was reported about the training of nurse practitioners, and only one study mentioned that a diploma was required [57].

Overall, reporting on the extent and content of the training undergone by nurses and nurse practitioners was lacking and was not sufficiently detailed for further analysis.

Outcomes

Table 2 provides an overview of patient-relevant outcomes, health services-related outcomes, clinical surrogate outcomes and professional outcomes reported in the meta-analyses.

Patient-relevant outcomes. Mortality was analysed in two meta-analyses, but was not linked to disease or indication. Both meta-analyses show a relative risk reduction in favour of nurse-led care [23, 37], whereby the results published in the Cochrane Review were not significant [23]. The effect was highest in the group of nurse practitioners with higher qualifications (RR 0.19) as opposed to standard nurse practitioners (RR 0.76) and registered nurses (RR 0.92) [37].

The same applies to hospital admissions [23, 37]. Upon closer examination of nursing staff training, a difference was shown between registered nurses and nurse practitioners. Whereas care conducted by physicians and registered nurses led to the same outcomes, care conducted by nurse practitioners led to better outcomes (RR 0.74) [37].

The results of the two meta-analyses indicated that patient satisfaction was higher when treatment was provided by nurses [23, 37]. In terms of training, the standardised mean difference (SMD) was higher for registered nurses (SMD 1.37) than for standard nurse practitioners (SMD 0.16) and nurse practitioners with higher qualifications (SMD 0.17) [37].

Table 2 Results from meta-analyses on outcomes relating to task-shifting

Category	Outcome	Effect	Effect estimates	Heterogeneity	Studies/N	Source
Patient-relevant outcomes	Mortality	↓	RR 0.89; 95% CI 0.84, 0.96	I^2 = 0%	10/14,652	[37]
		↔	RR 0.77; 95% CI 0.57, 1.03	I^2 = 0%	8/36,529	[23]
	Hospital admissions	↓	RR 0.76; 95% CI 0.64, 0.91	I^2 = 7%	5/3890	[37]
		↔	RR 1.04; 95% CI 0.78, 1.39	I^2 = 50%	3/16,466	[23]
	Physical function (better vs. not better)	↔	RR 1.03, 95% CI 0.98, 1.09	I^2 = 62%	3/3549	[23]
	Patient satisfaction	↑	SMD 0.18; 95% CI 0.13, 0.23	I^2 = 91%	7/5821	[37]
		↑	SMD 0.08; 95% CI 0.01, 0.15	I^2 = 56%	7/16,993	[23]
	Quality of life	↔	SMD 0.16; 95% CI 0.00, 0.31	I^2 = 85%	6/16,002	[23]
	Pain (rheumatic diseases)	↔	MD 0.76; 95% CI − 3.85, 5.38	I^2 = 0%	2/NA	[23]
Health services-related outcomes	Attendance at accident and emergency units	↔	RR 1.00; 95% CI 0.91, 1.09	I^2 = 0%	6/29,905	[23]
	Number of referrals	↔	OR 1.72; 95% CI 0.83, 3.58	I^2 = 93%	6/6944	[38]
	Hospital referrals	↔	RR 0.90; 95% CI 0.54, 1.49	I^2 = 71%	4/17,299	[23]
	Number of tests and investigations	↔	OR 1.56; 95% CI 0.87–2.80	I^2 = 76%	4/4116	[38]
		↔	RR 0.95; 95% CI 0.59, 1.51	I^2 = 76%	4/3654	[23]
	Number of patients returning for consultations	↑	OR 1.22; 95% CI 1.09,1.37	I^2 = 0%	7/6440	[38]
	Scheduled return visits	↔	RR 1.31; 95% CI 0.89, 1.94	I^2 = 86%	3/3934	[23]
	Attended return visits	↑	RR 1.19; 95% CI 1.07,1.33	I^2 = 0%	4/5064	[23]
	Mean number of patient visits	↔	MD 0.19; 95% CI − 0.31, 0.69	I^2 = 80%	5/2379	[38]
	Number of prescriptions	↔	OR 1.14; 95% CI 0.88, 1.48	I^2 = 77%	9/7092	[38]
		↔	RR 0.99; 95% CI 0.95, 1.03	I^2 = 5%	4/5702	[23]
	Length of consultation (min)	↑	MD 3.25, 95% CI 2.24, 4.27	I^2 = 91%	4/5286	[38]
	Length of consultation (% longer)	↑	SMD 0.38; 95% CI 0.22, 0.54	I^2 = 90%	4/5848	[23]
Clinical surrogate outcomes	Systolic blood pressure (mmHg)	↓	WMD − 4.27; 95% CI − 6.31, − 2.23	I^2 = 0%	5/1344	[39]
		↓	MD − 3.73; 95% CI − 6.02, − 1.44	I^2 = 0%	3/1023	[23]
	Diastolic blood pressure (mmHg)	↔	WMD − 1.48; 95% CI − 3.05, 0.09	I^2 = 28%	4/836	[39]
		↓	MD − 2.54; 95% CI − 4.57, − 0.52	I^2 = 0%	2/562	[23]
	Total cholesterol (mmol/l)	↔	WMD − 0.08; 95% CI − 0.22, 0.07	I^2 = 0%	4/981	[39]
		↔	MD − 0.15; 95% CI − 0.32, 0.02	I^2 = 0%	2/702	[23]
	Glycosylated haemoglobin (% HbA1c)	↔	WMD 0.12; 95% CI − 0.13, 0.37	I^2 = 0%	4/589	[39]
		↔	MD 0.08; 95% CI − 0.25, 0.41	I^2 = 0%	2/310	[23]
	Disease Activity Score (rheumatology diseases)	↔	MD 0.04; 95% CI − 0.17, 0.24	I^2 = 1%	2/NA	[23]
Professional outcomes	–	–	–	–	–	–

↔: statistically no difference, ↑: statistically significantly higher, ↓: statistically significantly lower

I^2: measure of heterogeneity; MD: mean difference; N: number of patients; OR: odds ratio; *p*: probability; RR: relative risk; SMD: standardised mean difference; WMD: weighted mean difference; 95%: CI 95% confidence interval; HbA1c: glycosylated haemoglobin; mmHg: millimetres of mercury; mmol/l: millimole per litre; NA: not available

No differences were observed in patient-relevant outcomes, between physician-led care and nurse-led care in terms of physical function, quality of life and pain [23]. Several endpoints could not be analysed in meta-analyses because the studies used differing or non-comparable outcomes, e.g. patient knowledge, patient empowerment [23].

Health services-related outcomes. No significant differences were observed between doctors and nurses with regard to the majority of health services-related outcomes. These included attendance at emergency units, the number of referrals, the number of hospital referrals, the number of tests and investigations, scheduled return visits, the mean number of patient visits, and the

number of prescriptions [23, 38]. Notably, no differences were observed between scheduled return visits, but a difference was found at attended return visits (RR 1.19) [23] and the number of patients returning for consultations (OR 1.22) [38]. Two meta-analyses found the length of consultations to be longer in nurse-led care [23, 38].

Clinical surrogate outcomes. Systolic blood pressure was reduced to a greater extent when nurses were consulted than when doctors were, but the difference was small (WMD − 4.27 mmHg [39], MD − 3.73 mmHg [23]). In the case of diastolic blood pressure, the Cochrane Review showed that a significant reduction resulted from nurse-led care [23], while another meta-analysis showed no difference [39]. No significant differences were observed in total cholesterol, glycosylated haemoglobin, or the disease activity score in patients with rheumatic diseases [23, 39].

Professional outcomes. We did not find any reports of professional outcomes.

Outcomes for chronic diseases and the course of diseases. One narrative review for chronic care concluded that most study estimates showed no significant differences between nurse-led care and physician-led care, with fewer than half (~ 40%) favouring nurse-led care [24]. This was almost the same for the course of diseases [40]. While most (84%) study estimates showed no significant differences between nurse-led care and physician-led care, nurses achieved better outcomes in the secondary prevention of heart disease and a greater positive effect in managing dyspepsia and lowering cardiovascular risk in diabetic patients.

Primary studies. Detailed information on the characteristics, interventions including tasks executed by nurses, and nurse qualifications (in as far as the information was provided), and outcomes from the primary study, can be found in Additional File 2: Characteristics, interventions (including nurses' qualifications) and outcomes of primary studies.

Discussion

This is the first overview of reviews to summarise existing evidence on the effects of shifting tasks from nurses to primary care physicians. We only considered high-quality evidence and used the OQAQ as a quality measure for included reviews. Generally, nurse-led primary care would appear to be as safe and effective as physician-led primary care. Mortality and hospital admissions are very probably as good if not better in nurse-led care than in physician-led care. The results include both acute and long-term care. Overall, little research is available on nurse practitioners.

The high informative value of umbrella reviews may be compromised by their methodological approach, which builds on secondary literature, if the most recent primary studies are not included. For this reason, we also looked for RCTs in our search, but did not find any. We therefore believe that the conclusions are based on the current state of scientific knowledge despite this methodological limitation.

Our findings are consistent with those of an umbrella review [25] that provided a more general overview of the situation across all health professionals. This umbrella review had a broader research question and aimed to formulate general topics suitable for task-shifting from physicians to all health professionals, whereas our study aimed specifically to compare the effectiveness of nurses and general practitioners. As a consequence, the work of Leong et al. [25] regarding nurses is not as in-depth as this present umbrella review. For instance, Leong et al. did not examine nurses' interventions and training in detail by extracting data from primary studies. The two reviews can therefore be considered complementary [25].

Nurses' training appears to be an important influencing factor that has not been sufficiently studied. The only meta-analysis to assess differences between registered nurses, nurse practitioners and nurse practitioners with higher qualifications revealed differences, with nurse practitioners with higher qualifications having the highest impact on mortality. In order to draw sustainable conclusions, it would be necessary to find out more about nurse (practitioner) training by analysing their curricula (e.g. the length of the training, content of lectures or clinical training, previous education and experience) and their professional experience. We therefore suggest conducting further research into training curricula and using the TIDieR (template for intervention description and replication) Checklist [75] to report on interventional studies and task-shifting. Overall, 40% of the primary trials included in this review were conducted in the UK, but the results of those carried out in other countries did not seem to differ, so we assume that nurse training is generally of high enough quality to allow task-shifting worldwide.

This overview reveals that patients are more satisfied with nurses than with doctors. One potential explanation for this difference in satisfaction levels is that patients were more satisfied because nurses provided longer consultations. However, it is not clear whether there is a correlation between the length of consultations and patient satisfaction [76].

One caveat is that a comparison between a (presumably experienced) doctor and a newly trained nurse might not be entirely fair, as experience leads to better outcomes. However, there was insufficient information in the primary trials about the experience of nurses or doctors.

Since the nurses performed well in the studies, it would not seem to have influenced outcomes.

The majority of the studies used guidelines or protocols in the interventions. The included systematic reviews do not always report whether the control-group physicians in the original studies were also trained to use guidelines. It is possible that the beneficial effects were due to guideline adherence among nurses, especially considering that studies have shown that physicians do not always follow guidelines [77, 78]. One of the included primary trials also made this point, because cholesterol levels were measured more often in patients with cardiovascular risk factors than in the nurse-led group [64, 79].

It is necessary to assess the merits of recruiting nurses to address the shortage of primary care physicians on a case-by-case basis in all healthcare systems and regions. This is particularly important in view of the fact that many countries also have a shortage of nurses. Depending on the availability of nurses worldwide [13], task-shifting may or may not be feasible and should probably be part of a larger discussion on the availability of training for both doctors and nurses in the respective country. It is also important to bear in mind that nursing should not focus solely on medical activities, but also on core nursing tasks. These also play an important role in primary care, and include patient education, working with relatives, wound care, incontinence advice, etc. In the primary studies, it was frequently reported that physicians provided support, which is why this overview is not wholly in favour of establishing nurse-led clinics. However, it would certainly appear that a team-based approach, in which nurses relieve physicians of some of their tasks would be particularly beneficial. In order to maximise the benefits for healthcare systems, flexibility is required in the deployment of physicians and nurses. However, any change in roles will have implications for existing hierarchies and legislation may need to be adjusted accordingly [80].

Task-shifting implies changes at training, clinical and organisational level. At the training level, task-shifting means that future nursing staff must be prepared for their responsibilities and the curricula must be developed accordingly. Pilot projects should also be carried out and scientifically monitored so that we can learn more about the necessity of certain teaching and training content. At a clinical and organisational level, task-shifting means changing all processes. This means that a change process must be initiated and SOPs must be reconsidered. It should not be forgotten that both doctors and nurses often have a traditional understanding of their profession and therefore sufficient time must be planned for this changing process. Furthermore, higher responsibilities will require also a higher remuneration of nurses.

Conclusions

Nurse-led care appears to be as safe or safer than physician-led care in terms of mortality and hospital admissions. Nurses should therefore be considered for task-shifting in primary care. Nevertheless, the importance of the level of nursing staff training has not been sufficiently examined, which is why we are hesitant to make generalisations. Although the underlying mechanisms are still unclear, patient satisfaction is higher among patients that have received nurse-led care.

Changes in the mix of skills provide health care systems with a means of raising flexibility and dealing with staff shortages.

Abbreviations

CA	Covered area
CCA	Corrected covered area
CINAHL	Cumulative Index of Nursing and Allied Health Literature
GP	General practitioner
MD	Mean difference
MeSH	Medical Subject Headings
OECD	The Organization for Economic Cooperation and Development
OR	Odds ratio
OQAQ	Overview Quality Assessment Questionnaire
PCP	Primary care physician
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
RCTs	Randomised controlled trials
RR	Risk reduction
SD	Standard deviation
SMD	Standardised mean difference
TIDieR	Template for intervention description and replication
UK	United Kingdom
U.S.	United States
WMD	Weighted mean difference
WHO	World Health Organization
WONCA	World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians

Supplementary Information

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Additional file 1.

Additional file 2.

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Author contributions

MPA made substantial contributions to the design, analysis, quality assessments, interpretation and first draft of the manuscript. NP screened abstracts and full-texts. USP extracted data, supported data analysis and the interpretation of data. AS designed the study and reviewed the manuscript. TS designed the study, conducted the literature search, screened abstracts and full-texts and carried out quality assessments. KJ designed the study and conducted the literature search. CRK extracted data, supported data analyses and the interpretation of data. KH performed quality assessments and supported data interpretation. All authors read and approved the final manuscript.

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