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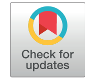
Review

The necessity and possibility of implementation of nurse prescribing in China: An international perspective



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Background: The number of countries where nurses are legally permitted to prescribe has grown rapidly due to a variety of external and internal forces. Despite its international popularity, nurse prescribing has not yet been implemented in China widely.
Objective: The intent of this paper is to review the current international literature regarding nurse prescribing so as to explore the necessity and possibility of implementation of nurse prescribing in China and classify the research gap.
Methods: Eight electronic databases including Embase, SpringerLink, EBSCO, CINAHL, Medline, Wiley, Science Direct, CochraneLibrary were electronically searched to identify related peer-review articles published in the English language only from 2007 to 2017. Relative references found from the identified studies were traced back to ensure that potentially eligible articles were included.
Results: Thirty-three publications which met the inclusion criteria were included in this literature review. The literature shows that not only could nurse prescribing provide quicker service, improvements in quality, but also could make better utilization of the nurses' professional skills and increase nurses' autonomy. Moreover, the barriers of nurse prescribing are explored to identify the factors that may facilitate the success of its implementation.
Conclusion: The review advises that nurses' views towards nurse prescribing have played a significant role in the success of nurse prescribing. While no literature regarding Chinese nurses' attitudes towards nurse prescribing could be identified, it is imperative to examine their attitudes on it. This would help Chinese healthcare policymakers ascertain the necessity of the introduction of nurse prescribing and provide them with valuable information for service planning.
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1. Background

Prescriptive authority has been strictly in control within the realm of the medical profession for a long time [1]. However, the authority of prescription has become a reality amongst nurses in a great number of countries in response to growing demands for healthcare, tight budget constraints and the growth of nursing specialities as a result of the expansion and advancement of their scope of practice [2,3]. Nurse prescribing has experienced a long process of development and was implemented at different times in different countries. It was first introduced in the state of Idaho, America in 1969 [4], and initially developed slowly but has rapidly evolved globally over the past two decades (see Table 1). To date certain nurses have been awarded to prescribe in more than 12 countries, including: the United State of America (USA), Canada, New Zealand, Australia, the United Kingdom (UK), Ireland, the Netherlands, etc. [5–10] (see Table 1). Despite its international popularity, nurse prescribing, which is perceived as a result of natural progress in nursing role expansion [11], has not yet been implemented in China widely.

A variety of external and internal forces contribute to the development of nurse prescribing. Countries such as the USA,

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Table 1
Countries where nurses legally prescribe medications and related information.

Country	Nurse Prescribing		Nurse Prescribing (progress)	
	Year	Type of nurse permitted to prescribe	Year	Type of nurse permitted to prescribe
USA	1969	Nurse specialists with a master's degree in Idaho (the first state in the USA awarded nurse prescribing)	2016	Nurse specialists with a master's degree in the whole country
Canada	1990	Nurse specialist with a master's degree in Ottawa (the first city in Canada awarded nurse prescribing)	2005	Nurse specialist with a master's degree in 11 provinces and territories
UK	1992	Community nurses with undergraduate level 3	2006	All trained nurses (attend 26-day course)
Sweden	1994	District nurses and nurses working in elderly care		
Norway	1998	Public health nurses		
Australia	2001	Nurse specialists with a master's degree		
New Zealand	2001	Nurse specialists with a master's degree and 4 years' work experience (can only prescribe a set formulary of drugs)	2014	Nurse practitioners (community nurses) with the authority to prescribe all medicines
Ireland	2007	Qualified nurse with at least a bachelor degree level (attend 28-day course and 12- day clinical supervision)		
Israel	2009	A registered nurse with 5 years' work experience		
The Netherlands	2012	Nurse specialists with a master's degree have independent prescriptive authority	2014	Registered nurse with a bachelor degree for supplementary prescriptive authority
Iran	2012	Registered nurses (only can prescribe Atropine or Adrenalin)		
Poland	2014	Nurse specialists with a master degree have independent prescriptive authority.	2016	Nurse specialists with a bachelor degree can prescribe so-called repeat medications.

Australia and Canada granted nurse prescribing so as to reduce the workload of doctors and meet the medication needs of patients in remote areas where physicians were scarce [8]. On the contrary, in China there is a greater need for nurses than there is for doctors [12,13]; this factor could be the reason behind the lack of Chinese nurse prescribing. However, China could learn from the countries like the UK and Ireland, where nurse prescribing was designed to create more efficient access to medications for patients [14] and took full advantage of nurses' knowledge and skills [15]. An acknowledgement of the development of advanced nursing practice is also an important force to drive the introduction of nurse prescribing [6]. Encouragingly, the nursing clinical career pathways are now well constructed and thus enable nurse specialists who have extensive experience and expertise to remain in clinical practice [6]. However, these nurse specialists find that their ability is hindered to provide holistic patient care owing to lack of prescriptive authority [16]. Consequently, countries such as the USA and Australia where advanced nursing practice was well established primarily authorised nurse specialists to prescribe [17]. Overall, these multiple driving forces put nurse prescribing firmly on the nursing agenda in many countries.

In China, nursing profession, which used to be a sub-discipline of medicine, has become an independent discipline since 2011. Consequently, nursing education is flourishing and gradually being reformed from a basic certificate programme to a degree course [18]. Meanwhile, nursing specialisation has been developed remarkably in recent decades and nurse specialists account for around 10.1% of all nurses in China [19]. They are playing a significant role in fostering the nursing professional development and some of them even work as nurse consultants in nurse-led clinics on an outpatient basis [18]. More importantly, the mainland of China may also learn from Hong Kong SAR, China, where nurse specialists have had prescriptive authority since 1996 [12].

Furthermore, the World Health Organisation (WHO) [20] emphasises that the nurses as front-line workers should be empowered and prepared to prescribe properly, suggesting that nurse prescribing has become an overwhelming global trend. Actually, it is shown that policymakers in various countries are seeking to modernize the health system aligned with other leading countries such as the USA [21]. For example, affected by the success of implementation of nurse prescribing in Sweden 1994, Norway was in line with this trend and thus implemented nurse prescribing in 1998 [22]. Actually, along with the process of globalization which is inevitable nowadays, the healthcare reform in China has been influenced by western countries [23]. In such a situation, the healthcare policymakers in Anhui Province who learn from international experience have permitted certain nurses to prescribe medications since November 2017. Although it is the only province that authorised nurse prescribing, it implies the introduction of nurse prescribing becomes possible.

While neither Chinese nor English literature regarding Chinese nurses' attitudes towards implementation of nurse prescribing could be identified in the database, whether they, especially nurse specialists, are willing to take on this emerging role in China is unknown. According to the Theory of Planned Behaviour (TPB), attitudes are viewed as the most proximal predictor of behaviour [24]. As proven by McConnell et al. [25] and Darvishpour et al. [21], negative attitudes amongst nurses can directly hinder the success of introducing new nursing roles, so it is vital to be aware of their attitudes when any new change is occurring in nursing practice. Therefore, the writer feels that it is imperative to examine nurses' attitudes towards role expansion in prescriptive authority in the Chinese context. This will help to ascertain the necessity of introduction of nurse prescribing and add to the body of knowledge for healthcare policymakers to enable service planning. Before conducting the surveys, the literature was reviewed so as to learn from foreign experience and explore the necessity and possibility of development of nurse prescribing in China.

2. Methods

2.1. Search strategy

Eight electronic databases including Embase, SpringerLink, EBSCO, CINAHL, Medline, Wiley, Science Direct, CochraneLibrary were electronically searched to identify related articles. The keywords included the following: attitude*, perception*, view*, perspective*, feeling*, prescrib*, prescriptive right, prescriptive authority, drug prescription*, formulary, nurs*, nurse specialist*, advanced practice nurse*. The search was highly sensitive, in that relative references found from the identified studies were traced back to ensure potentially eligible articles were included.

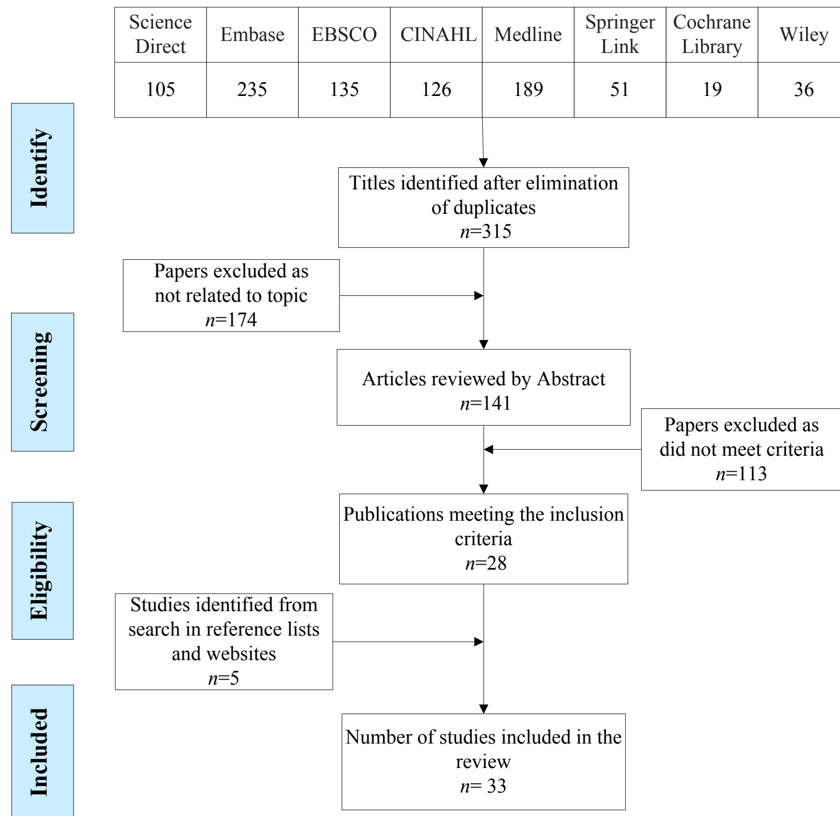

Fig. 1. The flowchart for the search and selection process.

2.2. Inclusion and exclusion criteria

Articles selected and analysed in this paper had to meet the following inclusion criteria: primary data-based peer-review quantitative, qualitative and mixed-method articles with full text published in the English language only from 2007 to 2017. Studies were excluded if they met any of the following: (1) studies that only concerned nurse prescribing for child vaccination or travel vaccination; (2) descriptive studies; (3) duplicate record literature.

2.3. Results

The electronic search yielded 315 articles after elimination of duplicates. 174 had no relevant to the research objectives and therefore excluded. Fig. 1 shows a flowchart of the selection process for articles identified in the study. Eventually, 34 articles were included in this literature review.

Overall, questionnaire surveys were the most commonly used methods in this literature review ($n = 19$), followed by interviews/focus groups ($n = 10$), mixed methods ($n = 4$) (see Table 2). A literature grid used for extracting data and developing themes is provided (Table 2) and four themes are revealed as follows. Four Themes of Nurse Prescribing.

3. Four Themes of Nurse Prescribing

3.1. Impacts of nurse prescribing

Much recent literature from patients' perspectives has proven the success of the implementation of nurse prescribing [26,27]. The general consensus in the literature is that patients are highly satisfied with prescriptions from nurses. Quicker service, improvements in quality and efficient patient care among the benefits are cited most frequently [26–28]. Advantages in regard to cost-effectiveness [29,30], enable continuity of care [26], enhancement of nurse-patient relationship [14,31] and improvements of patients' satisfaction [27,32] are also showed in the literature. Specifically, Tinelli, et al. [27] conducted a cross-sectional postal survey to investigate patients' views of care provided by nurse prescribers in six healthcare settings from different regions in England. It reveals that 94% of the patients (140/149) are very satisfied with nurse prescribers and the majority of them state that there is no difference in their experience of prescribing services given by doctors or nurses. Nevertheless, it is worth noting that this is an attitudinal survey and a 30% response rate could result in low response-rate bias [33]. More striking findings were uncovered in another study of Courtenay et al. [26], who undertook semi-structured interviews with a consecutive sample of 42 patients and revealed that the patients favour nurses to issue their medications as they believe that nurses are more compassionate and empathic, attentive and available to their needs.

Other positive and negative impacts of nurse prescribing have been widely reported in the literature as well. Interestingly, it is reported that nurses have a calming influence on patients [26] and nurse prescribers help to reduce polypharmacy in the elderly [9]. Additionally, nurse prescribers use a holistic approach that provides more detailed consultations compared to doctors and offers medicine management support for patients. This is in accordance with the main aim of a patient-oriented healthcare system [34]. However, Offredy, et al. [35]performed an exploratory study involving interviews and case scenarios which were utilised to test nurse prescribers' pharmacological knowledge; they uncovered that nurses are capable to exercise prescribing in their exact small area of practice, but stumble outside of this and thereby patient

Table 2
Published articles that include in the literature review.

NO.	Author	Key findings	Methodology
1.	Binkowska-Bury et al., 2016 [10]	Doctors (43.8%) refuse to believe that nurses can correctly perform physical examination. Polish nurses present cautious attitudes towards the implementation of the new rights.	Quantitative study Questionnaire surveys
2.	Darvishpour et al., 2016 [21]	Facilitators of nurse prescribing were labelled "positive views of health policymakers," "human resources capabilities," "non-medical prescribing experiences," and "governmental and non-governmental organizational activities." Barriers of nurse prescribing were "socio-cultural factors," "organizational factors," "educational barriers," and "human barriers."	Qualitative study Interviews
3.	Wilkinson, 2015 [9]	RN prescribing was expected to improve efficiency and access to medicines for high-needs populations, clarify accountability and improve nurses' autonomy.	Mixed methods Questionnaire surveys
4.	Fong et al., 2015 [8]	The key themes identified internationally related to NP prescribing relate to barriers to prescribing, confidence in prescribing, and the unique role of NPs in prescribing medicines.	Literature review
5.	Phillips and Wilkinson, 2015 [38]	Diabetes nurse specialists agree that prescribing improves access to diabetes services, diabetes management, continuity and quality of care, the use of diabetes nurse specialist time and skills, team dynamics, and reduces delays for patients. The study implications are that diabetes nurse specialists are ready to become prescribers and more are needed.	Quantitative study Questionnaire surveys
6.	Ross et al., 2014 [14]	Mental health nurse prescribing has the potential to improve client care and appears to be the preferred choice of clients who have experienced it.	Qualitative study Interviews/focus groups
7.	Gielen et al., 2014 [64]	Nurses prescribe in comparable ways to physicians. Clinical parameters were the same or better for treatment by nurses, perceived quality of care was similar or better and patients treated by nurses were just as satisfied or more satisfied.	Systematic review
8.	Drennan et al., 2014 [30]	The number of items prescribed by nurses rose from 1.1% to 1.5% of total items prescribed in primary care. The percentage of prescriptions written by nurses in primary care in England is very small in comparison to physicians.	Quantitative study
9.	Kroezen et al., 2014 [36]	The proportion of nurses who said that they felt adequately equipped to prescribe medicines remained constant around 12%. Insufficient knowledge to prescribe remained the most important reason for feelings of inadequacy	Quantitative study Questionnaire surveys
10.	Kroezen et al., 2014 [43]	When compared RNs, nurse specialists are more confident on nurse prescribing. RNs, nurse specialists and physicians generally hold neutral to moderately positive views on nurse prescribing.	Quantitative study Questionnaire surveys
11.	Smith et al., 2014 [69]	Most nurses felt their prescribing course met their learning needs and stated course outcomes and that they had adequate development and support for prescribing to maintain patient safety.	Qquantitative study Questionnaire surveys
12.	Tinelli et al., 2013 [27]	30% of patients responded. Most said they were very satisfied with nurses' last visit (94%), they were told as much as they wanted to know about their medicines (88%). They had a good relationship with (89%) and confidence in (84%) their prescription. When comparing nurse and doctor prescribing services, most patients reported no difference in their experience of care provided.	Quantitative study Questionnaire surveys
13.	Naughton et al., 2013 [40]	The reviewers judged that 95–96% of medicines prescribed were indicated and effective for the diagnosed condition. The majority of nurse and midwife prescribing decisions were deemed safe and clinically appropriate. However, risk of inappropriate prescribing with the potential for drug errors was detected.	Audit
14.	McConnell et al., 2013 [25]	The scope of practice was perceived to be influenced by internal factors such as competence; however, protocol use, referral rights and prescribing authority could be considered ways that nursing management and medical staff indirectly control the role.	Mixed methods Questionnaire surveys
15.	Buckley et al., 2013 [68]	Participants reported prescribing 234 separate medications and anti-infective drugs were most frequently prescribed, the medications prescribed highlight the diversity in scope of practice among nurse practitioners.	Quantitative study Questionnaire surveys
16.	Ben Natan et al., 2013 [42]	The older respondents and the higher their image of nursing, as well as their knowledge on expanding nurse authority to prescribing medication for chronic conditions, the more positive their attitudes towards this expansion of authority.	Quantitative study Questionnaire surveys
17.	Ross and Kettles, 2012 [45]	Barriers identified in the study included concern about how prescribing impacts on the therapeutic relationship, role conflict, lack of support, inappropriateness of prescriber training, remuneration, qualifying to prescribing time, supervision, prescribing policies, clinical governance and nurse management.	Mixed methods study Questionnaire surveys/focus groups
18.	Scrafton et al., 2012 [54]	Three main themes emerged from the analysis: motivations behind becoming a nurse prescriber; benefits and limitations of prescribing education and continuing professional development and prescribing in practice. Nurses felt nurse prescribing offers clear benefits in relation to patient care.	Qualitative study Interviews
19.	Jones et al., 2011 [32]	Nurse prescribing was found to benefit patients through service delivery improvement and using staff skills differently. Nurses and doctors were found to provide equivalent care. Shared vision, local champions, action learning and peer support were the enabling factors that helped to embed the new prescribing roles.	Mixed methods study Observation/Questionnaire surveys
20.	Courtenay et al., 2011 [26]	Nurses' specialist knowledge, interactive and caring consultation style, and continuity of care improved confidence in the nurse and treatment concordance.	Qualitative study Interviews
21.	Earle et al., 2011 [57]	Nurse prescribing appears to work well in a specialist mental health setting when carried out in a supported and structured way.	Qualitative study Interviews
22.	Shannon and Spence, 2011 [11]	GPs and physicians were aware and supportive of heart failure nurse specialist prescribing with both agreeing on its benefits for patient care and other professionals. GPs and physicians viewed heart failure nurse specialist prescribing in a positive way and as a natural progression in role expansion.	Qualitative study Interviews/focus groups
23.	Patel et al., 2009 [44]	Psychiatrists had significantly less favourable, albeit generally positive attitudes than mental health nurses regarding general beliefs, impact, uses, clinical responsibility and legal responsibility. Approximately half of all participants agreed nurse prescribing would create conflict in clinical teams.	Quantitative study Questionnaire surveys
24.	Wells et al., 2009 [47]	A total of 69 (67%) participants reported that they felt nurses have the expertise to prescribe medication within their scope of practice. However, a significant proportion (33%) either was undecided or did not believe that mental health nurses had this expertise.	Quantitative study Questionnaire surveys
25.	Carey et al., 2009 [31]	Nurse prescribing was reported to improve safety because nurses were able to take responsibility. Nurses said that their new responsibilities as prescribers made them more aware of safety issues.	Qualitative study Interviews
26.	Stenner and Courtenay, 2008 [29]	Nurses reported a number of benefits, including faster access to treatment, improved quality of care, improved safety, improved relations and communication with patients, greater efficiency and cost	Qualitative study Interviews

(continued on next page)

Table 2 (*continued*)

NO.	Author	Key findings	Methodology
		effectiveness. Nurses benefited from increased job satisfaction, credibility with patients and healthcare professionals and also gained knowledge through prescribing.	
27.	Berry et al., 2008 [28]	Patients indicated a relatively high level of confidence in nurse prescribing and stated that they would be very likely to take the selected medication.	Quantitative study Questionnaire surveys
28.	Offredy et al., 2008 [35]	The majority of participants were unable to identify the issues involved in all the scenarios; they also failed to provide an acceptable solution to the problem. The lack of appropriate pharmacological knowledge coupled with lack of confidence in prescribing was demonstrated.	Qualitative study Interviews
29.	Carey et al., 2008 [37]	A medicines management intervention, provided by a Diabetes Specialist Nurse prescriber, had a positive effect on the system of delivering medicines to patients with diabetes and significantly reduced the number of errors.	Quantitative study Longitudinal analysis
30.	Ryan-Woolley et al., 2008 [66]	Only 13% (203) had undergone prescribing training and of these 105 provided responses to the open questions concerning training and of the 87% (1372) who had not undergone the training, 423 provided details on barriers to nurse prescribing training.	Quantitative methods Questionnaire surveys
31.	Latter et al., 2007 [51]	Only half of the sample had experience of formally provided professional development opportunities. Approximately half (52% 127/246) of the sample identified needs for continuing professional development.	Quantitative study Questionnaire surveys
32.	Courtenay et al., 2007 [60]	Independent extended/supplementary nurse prescribers work predominantly in primary care and do prescribe medicines. These nurses are highly qualified and have many years clinical experience. Supplementary prescribing is used by a minority of nurses.	Quantitative study Questionnaire surveys
33.	Bradley and Nolan, 2007 [53]	Prescribing has the potential to increase job satisfaction and autonomous working, with the result that nurses are more likely to involve patients in decision-making about their care. Prescribing enhances nurses' knowledge about medication and increases their confidence to engage in prescribing decisions across the healthcare team.	Qualitative study Interviews

safety is a concern. This sentiment is echoed in part by the studies of Wilkinson [9], Kroezen, et al. [36], Binkowska-Bury et al. [10], where doctors have expressed concerns about patient safety because they perceived that nurses lacked pharmacology knowledge and were not trained in the same way as doctors.

However, a great deal of evidence has shown that being prescribed by nurse specialists is safe and clinically effective for patients [31,37,38]. Some studies show that when compared to doctors, there were no significant differences in regard to clinical outcomes found in patients taking prescriptions from nurse specialists [4]. Surprisingly, one quantitative study conducted in Canada by Tobe et al. [39] even uncovered that hypertensive patients receiving medications prescribed by nurse specialists had a remarkably greater drop in diastolic blood pressure than those receiving prescriptions from doctors. Additionally, in another study performed by Naughton et al. [40]in Ireland, 208 prescriptions issued by 25 nurse specialists were evaluated by two expert reviewers; they judged that approximately 95% of medications were indicated and effective for the diagnosed condition. While no literature related to comparison between general nurses and doctors or general nurses and nurse specialists on the effects of prescription concerning clinical outcomes could be identified in the database, whether these satisfied findings are contributed by nurse specialists rather than general nurses could not be justified.

Some disputation regarding to the impacts in the relationship between doctors and nurses is reported. Some scholars argue that nurse prescribing has blurred professional boundaries with jurisdictional responsibility for prescribing between the nursing and medical professions [41–43]. This leads to affect therapeutic relationships and raises role conflict, which in turn has negative influence on patient care [44,45]. Nevertheless, as a result of a large-scale mixed methods study involving 329 questionnaires and 18 interviews, Jabareen [16] has proven that nurse prescribing is an effective way to enable interdisciplinary cooperation and to bridge the distance between nurses and other professions, benefiting the whole team and allowing doctors to focus on more complicated clinical cases. These results are supported by another study of Stenner and Courtenay [29], who report that nurse prescribing shows nurses' willingness to take responsibility for prescribing, which in turn helps to smooth relations between professionals. This suggests that nurse prescribing may have a positive influence on the relationship between nurses and other professions.

Though overall plentiful benefits of nurse prescribing are reported in the literature, the process of introduction of nurse prescribing experiences a great number of barriers and the writer therefore will develop this in the following theme. Only if the barriers are classified, strategies could be developed to address these. Once barriers could be overcome in practice, it may result in a more positive working environment, which will ultimately benefit patients [21].

3.2. Barriers of nurse prescribing

Resistance from doctors is always viewed as a significant barrier when introducing nurse prescribing. Doctors are conventionally deemed to be at the top of a hierarchy and thus are notoriously protective of their prestige and power [46]. Hence, as an expansion of traditional role, nurse prescribing has been debated continually within the literature, questioning if nurses should broaden their scope of practice [47]. In the UK for example, before implementing nurse prescribing on a national scale in 2006, negative attitudes from quite a few doctors have been illustrated in the literature, arguing that the essence of nursing was lost by expanding the nursing role of prescription [46]. In an article published in The Lancet, Aidroos [48] debates that rather than fighting for the prescriptive authority, nurses should focus on comforting sick and troubled patients to maintain their wellbeing and enhance their resilience. Interestingly, although arguments and resistance from doctors have been fuelled in the face of nurse prescribing, the UK still awarded all suitably qualified nurses to prescribe any drugs except controlled drugs since policymakers believed that this decision to expand practice should be driven by a desire to improve the continuity and quality of patient care [15]. A similar picture can be found in the Netherlands and Ireland when nurse prescribing first began [7,49].

Indeed, recent evidence shows that doctors' attitudes towards nurse prescribing have changed over time, especially after implementation of nurse prescribing in these countries. In a qualitative study with 21 doctor participants, it was conducted to investigate their views of heart failure nurse specialists in the UK, Shannon and Spence [11] discovered that doctors perceived nurse prescribing in a positive way and as a natural progression in role expansion. The

majority of the participants agreed that nurse prescribing was beneficial for both patients and other professionals, because nurse prescribers could provide more convenience for patients and reduce doctors' workload [11]. Although these doctors highly accepted nurses to prescribe, it should be highlighted that these nurse prescribers were all nurse specialists in this study. As stated by Stenner et al. [50], doctors' acceptance towards nurse prescribing is conditional upon the nurse prescribers' level of experience and qualifications.

Inadequacies in the pharmacology knowledge of some nurses is identified as another recurring barrier to hinder the success of the implementation of nurse prescribing [35,51,52]. It is essential to provide nurses with adequate educational preparation before they are awarded to prescribe so as to achieve the aim of implementation. Latter et al. [51]conducted a study with a random sample of 246 nurse independent prescribers to evaluate their educational preparation in the UK and revealed that insufficient preparation in pharmacological training was perceived as the greatest problem amongst course participants. However, it is worth noting that nurses' confidence and competence in relation to prescribing could be developed gradually when they begin to actively prescribe, provided that they have received sufficient training [31,52,53]. There are some highlighted issues related to pharmacological education such as the necessity for additional support in pharmacology after completion of the training programme [45] and the need to ensure that pharmacology lectures were fitted to nurses' clinical practice [54].

The voluminous paperwork with respect to recording each prescription and prescribing limited to certain drugs are demonstrated as barriers that hamper the development of nurse prescribing. For instance, McBrien [49] reports that too much paperwork associated with registering each drug prescribed has created negative attitudes and led to despondency among nurse prescribers in Ireland. Moreover, nurse prescribing has been proven to be advantageous for pain management [29], yet, in a national survey study, most nurse prescriber participants reported that they were limited by legislation on prescribing analgesics which were frequently used in their workplace and they often need to refer to a doctor to prescribe; this leads to delay the pain control treatment for patients [55].

A lack of organizational preparedness, public awareness, legislation, funding and regulation are viewed as other essential barriers of nurse prescribing [50,54,56]. For example, a lack of financial incentives is a factor that affects nurses' willingness in terms of taking on the new role of prescribing [57]. This statement is echoed by Green et al. [58], who note that nurses' additional prescribing responsibilities should be recognized and supported by financial incentives. Otherwise, nurses may harbour anger on this emerging role [57]. Moreover, Shoqirat and Cameron [56] point out that socio-cultural factors such as nurses' low social prestige of the nursing profession and poor public image may impact patients' confidence on nurse prescribing. In light of this, the authors suggest that both the media and nursing organizations should work together to enhance nurses' professional identity in society [56]. Additionally, to achieve the introduction of nurse prescribing it is clear that policies involved, both locally and nationally, must support it, and legislation is also needed to clearly tackle the issue of accountability for any mistakes made in the prescribing process [59]. Moreover, nurses and the multidisciplinary team should be fully informed of the commitment required for successful implementation, prior to undertaking training [6].

In brief, a great deal of barriers should be taken into consideration before the implementation of nurse prescribing in a country. Given the important role played by nurses in supporting or impeding the development of nurse prescribing [49], it is important to consider their views on role expansion and therefore the writer will explore those below.

3.3. Role expansion

It has been widely proven that the majority of nurses have welcomed this advancement since it is viewed as recognition of a role that they have been undertaking informally for many years [36,50,60]. It has resulted in legitimizing nurses' prescribing practice, where previously nurses issued medicines under uncertain legal conditions, such as administrating lifesaving medications for patients with anaphylactic shock [50,60]. Moreover, having a recognized prescribing qualification increases nurses' credibility with doctors and patients, which is essential to the nurses when they are recommending medications to doctors [29,31,61].

Additionally, it has been found that nurse prescribing provides the potential to make better utilization of the professional skills and knowledge of nurses [32,38], increase nurses' autonomy and job satisfaction [31], increase professional development, and enhance self-esteem [54]; additionally, it promotes nurses' attraction to the nursing profession and retention rates [21]. However, increasing nurses' autonomy via implementation of nurse prescribing in practice could in turn raise many issues concerning appropriate clinical decision-making on issuing medications [61] and self-restriction [41], such as receiving financial incentives from pharmaceutical sales representatives who try to persuade them to issue specific drugs [62]. This is illegal and detrimental to patients. This startling finding should be paid great attention when implementing nurse prescribing.

Fear of making an error and a lack of confidence with regards to changing medications or making a diagnosis for patients is a recurring theme in the studies [21]. According to a qualitative study conducted by Weglicki et al. [52], the majority of general nurses express anxiety that they are not keeping up to date with medical knowledge and thus fear making incorrect decisions when prescribing. Similarly, a national study which investigated 644 general nurses in the Netherlands revealed that only 12% of the participants felt adequately equipped to prescribe medicines and insufficient pharmacological knowledge was the main reason for feelings of inadequacy [36]. By contrast, Phillips and Wilkinson [38] who undertook a study with 92 nurse specialist participants in New Zealand report a significantly different result, stating that 72.8% of the participants are confident to become prescribers. This difference in results may be because the participants in the former two studies were general nurses while those in the latter study were nurse specialists, suggesting that qualifications and knowledge could increase nurses' adaption to this emerging role. Furthermore, these findings implicate that nurses from different countries may hold very different views on nurse prescribing. More importantly, it implies that the decision to expand this new role should be individual to each nurse [63].

Some may argue that doctors are the main opponents within health professions [5], while some scholars state that the significant resistance on nurse prescribing is from nurses themselves [21,41]. Though prescriptive authority has been actively sought by nursing professional organizations in many countries [64], some nurses have expressed concerns regarding increasing their workload [41] and ambivalence to a more medically orientated role [47]. For instance, some studies reveal that nurses feel challenged to balance their new scope due to the fact that the additional work involved in nurse prescribing increases workloads for nurses, especially where boundaries of the prescribing roles and nursing work are blurred [31,41,57]. Furthermore, some researchers reveal that some nurses show apathy to receive prescribing training to become a prescriber [65,66]. One of the largest

surveys was conducted in the UK to investigate Macmillan nurses' views on nurse prescribing in palliative care [66]. In this study, 1575 Macmillan nurses were surveyed on their views on nurse prescribing; only 13% of them had undertaken prescribing training, and only 46% among them felt that prescribing was a role they were willing to take on. A similar picture was shown in a study conducted in Poland, where the majority of nurse participants (n = 539) expressed negative attitudes towards the implementation of the new rights [10]. These findings suggest that in order to promote the development of nurse prescribing, nurses must first begin with themselves and create changes within their own practice [21].

Although a considerable amount of research has been undertaken in relation to the attitudes of nurses towards nurse prescribing, there is a lack of research associated to comparing views on nurse prescribing held by nurses with different levels of knowledge and competence. To date, only one article found in the literature has examined the different views between general nurses and nurse specialists. It is a nationwide large-scale web survey study which aims to gain insight into the views of general nurses ($n = 617$ with a response rate 66%) and nurse specialists ($n = 375$ with a response rate 28.3%) towards nurse prescribing in the Netherlands [43]. The authors revealed that nurse specialists scored significantly higher on the confidence of nurse prescribing when compared to general nurses. This study, which could be considered a national representation, has certainly added to the body of knowledge from these two groups' perspectives. Yet, it should be noted that the response rates for nurse specialists (28.3%) were fairly low, which may cause low response-rate bias [33]. Furthermore, since a convenience sampling strategy, which is a weak form of sampling, was utilised in this study, the results cannot be generalizable to the target population [67]. Meanwhile, this research was undertaken at a time when nurse specialists already had prescriptive authority while general nurses did not, which may affect respondents' answers. Therefore, these results should be interpreted with caution and further research is required to investigate these two groups' attitudes towards nurse prescribing.

If implementation of nurse prescribing is achieved, what qualifications and work experience should nurses have for prescriptive authority? This needs to be investigated in the final theme.

3.4. Nurses' qualifications required for nursing prescribing

There is variation between countries as to the qualifications of nurses with prescriptive authority. For example, to obtain nurse prescribing licensure, countries such as New Zealand and Australia require a minimum of a master's degree qualification, a minimum of five years' work experience, an expert knowledge base and complex decision-making skills [8,9]. America has even started to require a doctorate degree as the entry level qualification [17]. By contrast, it is much less restrictive in the UK, where any registered nurse with a minimum of three years' work experience is eligible to be trained as a prescriber [14] (Table 1).

In fact, although the UK has awarded all trained nurses to prescribe, many studies have uncovered that nurse prescribers did not prescribe for many reasons, such as incapability in prescribing or unwillingness of taking the responsibility [35]. In a mixed methods study and a qualitative study performed in the UK, with 33 and 25 general nurse prescriber participants respectively, both studies reveal that 60% of the participants were not prescribing [35,45]. Conversely, countries like the USA or Australia, where nurse prescribers are highly qualified with at least a master's degree, show that the amounts of medications prescribed by nurse prescribers are comparable with those prescribed by doctors, particularly for the patients with chronic illness [68]. Furthermore, some studies show that patients' preference is for nurse prescribers who are highly qualified and experienced [6,53]. These findings may suggest that nurse's level of knowledge and competence is significant for the success of nurse prescribing, and nurses' educational qualifications and work experience should be fully considered for healthcare service seekers when deciding what type of nurses should be authorised.

International differences between the professional status of nurses, and professional bodies legislative procedures responsible for the regulation of nurse prescribing have contributed to the worldwide differences of scope, range and models of nurse prescribing practice [7,10](Table 1 3). For instance, differences exist in whether and how much supervision of prescribing practice must be undertaken when nurse prescribing is granted, resulting in that two main models, independent or supplementary prescribing, are in place. In general, nurses with the independent prescribing model are highly autonomous, allowing them to prescribe and diagnose without direct doctor involvement in the process and they need to take the complete responsibility for the diagnosis and prescribing for patients [3]. In contrast, supplementary prescribing is based upon a voluntary prescribing partnership between a doctor and a nurse; the nurse could prescribe certain drugs but only when strictly supervised by the doctor [3].

Currently the two models coexist in the UK and the USA [5,69], while countries like New Zealand, Sweden and Australia have selected the independent prescribing mode [78](see Table 3). According to a Polish national survey study which involves 539 nurse participants, Binkowska-Bury et al. [10] discover that 49. 9% of them preferred to be supervised by doctors in terms of nurse prescribing and only 43. 9% of them believe that nurses could correctly perform physical examinations, while this skill is fundamental for independent nurse prescribers before issuing prescriptions [10]. These findings imply that nearly half nurses tend to favour supplementary prescribing authority. Yet since the subjects were general nurses, whether nurse specialists hold the same attitudes needs further research. On the other hand, based on a literature review regarding the evaluation of supplementary prescribing in the UK, the authors [65] conclude that although nurses show enthusiasm in supplementary prescribing, doctors' apathy potentially undermines the success of supplementary prescribing, leading to this model tending to be superseded by independent prescribing. However, evidence is not strong enough to draw a conclusion as to which model of nurse prescribing has been more successful in functioning in these countries through the literature review, so which model should be recommended to introduce in China needs further research.

Table 3
Models of nurse prescribing in different countries.

Country	Independent prescribing	Supplementary prescribing
USA	✓	✓
Canada	✓	
UK	✓	✓
Sweden	✓	
Australia	✓	
New Zealand	✓	
Ireland	✓	
Finland	✓	
Norway	✓	
South Africa	✓	
Hong Kong SAR, China	✓	
Netherland	✓	✓
Spain	✓	✓
Israel		✓
Poland	✓	✓

4. Discussion

The review has shown that not only could nurse prescribing provide quicker service, improvements in quality, efficient patient care, and continuity of care for patients, but also could make better utilization of the nurses' professional skills and knowledge and increase nurses' autonomy and job satisfaction. However, nurse prescribing, which has been awarded to nurses in a great number of countries, has not been introduced in China.

Parker and Hill [70] state that due to the Chinese context of an aging society with the biggest population in the world, it is imperative for Chinese nurses to be prepared and recognized for a more advanced role with a broader scope and greater complexity. Evidence in other countries such as New Zealand, the Netherlands and the UK shows that nurse prescribers are playing a significant role in issuing prescriptions for the growing number of senior citizens with chronic diseases [37,38,71]. Given the situation in current Chinese health services of long waiting times [72], any initiative which aims to change this situation would be welcome in China.

The role of the advanced nursing practice has become a global trend in the 21st century [73]. Similarly, Chinese healthcare policymakers sought to raise the standard of specialist care in line with other leading countries; thus, they designated nurses to study in Hong Kong where the hospitals are reputed for their high standards in quality service and specialty training for nurses [74]. A total of 615 nurses successfully completed their ten-month specialist training programme in Hong Kong from 2007 to 2011 [74]. These nurses are playing a significant role in advancing Chinese nursing practice [18]. Meanwhile, as the nursing specialism education programme progresses in the mainland of China, the number of nurse specialists is increasing rapidly and accounts for around 10.1% of all nurses [19]. These nurses primarily work as nurse consultants in nurse-led clinics or inpatient departments [18]. However, unlike the Hong Kong nurse specialists who have prescriptive authority, nurse specialists in the mainland of China find that their abilities are hindered to provide holistic care for patients as they lack nurse prescribing [12]. Indeed, similar situations are often found in the authors' workplaces. For instance, the authors found enterostomal therapy nurse specialists were not able to prescribe some necessary medicines in a timely manner for patients with stoma because they had to refer these patients to doctors, which leads to discontinuity of patient care. Therefore, the authors feel that nurse prescribing should be addressed as a matter of urgency in the Chinese context.

5. Conclusion

In summary, this literature review has focused not only on whether nurses should be awarded to prescribe in China but also on the exploration as to impacts and barriers of implementation of nurse prescribing internationally. General consensus in the literature is that nurse prescribing benefits patients in many ways. Moreover, nurse prescribing suggests an increase in professional autonomy of nurse practitioners, in addition to other important impacts on the nursing career. The author agrees that transferring part of the responsibility in the treatment process to nurses is an effective way to bridge the distance between the professions, and to enable interdisciplinary cooperation, benefiting doctors [16].

The review highlights that nurses' views towards nurse prescribing have played a significant role in the success of nurse prescribing and the findings advise that general nurses and nurse specialists may hold different views towards the implementation of nurse prescribing. Yet there is no empirical research allowing to have understanding of their attitudes towards nurse prescribing in the Chinese context. Whether they, especially nurse specialists, are willing and ready to take on this emerging role in China is unknown. Therefore, it would be interesting to further investigate this research question since this knowledge will provide valuable and useful information for Chinese policymakers, as well as raising Chinese nurses' awareness of the significance and necessity of this role expansion.

A potential limitation of this literature review is that no English literature with regard to nurse prescribing in the Chinese context could be identified and included, so the review is primarily from other international perspectives. However, it is understandable since this is a new issue and in its infancy in China. The author has verified the findings by comparing them with what is known about these issues elsewhere. Methodological strengths are noted in the majority of the quantitative research in this chosen topic, ranging from multiple research sites and large-scale sample sizes. However, there are some weaknesses found in both quantitative and qualitative studies, including low response rates and non-probability sampling. Therefore, these methodological issues should be kept in mind when design a research project.

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