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Nurse-led cancer care: A scope review of the past years (2003-2016)

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1. Introduction

Nursing practice has been expanded greatly with time passing by. One innovative form of nursing practice is nurse-led care. The term "nurse-led care/service" has been introduced in nursing discipline for years as early as in 1960s [1]. Later, several nurse-led services were reported in 1980s and 1990s [2–7]. The common characteristics in these units were that the nurses provided additional things to improve patients' care, and the standard of practice was extremely high [8].

The accelerating development of nurse-led care was triggered by the health care system reform in United Kingdom (UK) around 2000. In 1999, the UK government document 'Making a difference' was published [9], under the pressure of redesigning services to reduce waiting time and medical cost and to meet shortfalls in junior medical staffing [10]. Since then, nurse-led care has been reported in increasing studies [11].

The nurse-led care in cancer community has been developed with the cancer care reform as well. Under the pressure of increasing cancer patients, treatment delivery has changed a lot. Early discharge after surgery and outpatient-based or home-based adjuvant treatment have been widely used [12]. Under such health care reform, nurse-led care is one possible solution to improve the quality of cancer care, which has been highly recommended [13]. A previous review suggests that the nurse-led cancer care is effective, safe and acceptable by patients with higher satisfaction, compared with conventional care model [12].

Although encouraging outcomes of nurse-led care were reported both in cancer area and other areas, the researchers are interested to know how the encouraging outcomes have achieved. What are the effective components of nurse-led care? Corner (2003) indicates that the promising outcomes are not automatically achieved in all the studies of nurse-led care [12]. The structure and process of nurse-led care are highly associated with outcomes [14]. More studies are required to understand the complex and dynamic effects of nurse-led care [12].

It has been more than ten years since Corner's review on nurse-led cancer care [12]. It is time to examine the development of nurse-led cancer care worldwide. Therefore, this review aimed to understand nurse-led cancer care based on literature published during the past years and to explore important factors in structure and process which lead to positive outcomes of nurse-led cancer care. Specifically, the objectives of this review were: (i) to identify the practice scope of nurse-led cancer care; (ii) to examine the structure of nurse-led cancer care programs; (iii) to examine the process of nurse-led cancer care programs; (iv) to explore the outcomes adopted and achieved in nurse-led cancer care programs.

2. Methods

2.1. Definitions and types of nurse-led care

Clear definitions and terms are essential to understand what are discussed in this review. Despite the increasing research on nurse-led care, there is no clear and consistent definition of nurse-led care [15]. Corner (2000) suggests that nurse-led care should include two types of care model: delegation model and comprehensive practice model [12]. In the former model, nurses are delegated to accomplish specific tasks which used to be done by medical staffs. This kind of care is usually well defined and consists of technical tasks. In the latter model, more nursing components are involved during care delivery; nurses take responsibility for an area of care and have considerable autonomy in making clinical decision [12]. The latter model seems to be accepted by more scholars. McMahon (1998) points that nurse-led care should be those nursing practice which is the leading therapy for patients, not simply replace doctors [8].

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Richardson and Cunliffe (2003) propose that the important components of nurse-led care are independent practice and scope for autonomous decision making [11].

In addition to the abstract definition of nurse-led care, some researchers define the term in a practical approach. Hinds (2008) summarizes that the nurse-led care is characterized by evidence-based and patient-centered care, which is focused on patient-centered outcomes and delivered by advanced practice nurses [16]. Wong and Chung (2006) define the nurse-led care from three aspects: structure, process, and outcome [14]. Richardson and Cunliffe (2003) summarize that the key activities of nurse-led care include: (i) direct referral mechanism; (ii) assessment and technical skills; (iii) freedom to initiate diagnostic tests; (iv) prescription (to protocol) of medications; (v) increased autonomy and scope for decision making; (vi) discharge [11]. Based on the opinions proposed by previous scholars, the comprehensive practice model of nurse-led care was reviewed in this article from three aspects: structure, process, and outcomes.

2.2. Literature search method

Articles of nurse-led care in cancer community which were published between January 2003 and December 2016 were searched. A series of literature search was conducted on seven English electronic databases: British Nursing Index (BNI), Cumulative Index to Nursing and Allied Health literature (CHINAL), Medline, Ovid, PsycInfo, Proquest Dissertation, and Scopus. The following combination of key words was used: (oncolog* OR cancer) AND (care OR service OR nursing) AND ("nurse-led" OR "nurse led"). The year 2003 as a starting point was because the earliest review on nurse-led cancer care [12] was published and no comprehensive review on this topic has been published afterwards.

The inclusion criteria for articles were: (i) being published in English language; (ii) being research article, case report, pilot study, or audit; (iii) fitting the comprehensive practice model. The following articles were excluded: (i) those in which nurses' work was only a delegation of medical role; (ii) commentary, editorial, or poster abstract; (iii) nurse-delivered interventions for single symptoms/problems; (iv) nurse-led follow-up care for post-treatment cancer survivors as an alternative service of conventional follow-up service. The articles of nurse-led follow-up care were excluded because two comprehensive review articles were published on this topic recently [17,18]. The search identified potentially eligible articles by screening titles and abstracts (Fig. 1). After reading full texts, 22 nurse-led cancer care programs (i.e. 26 articles[1]) were included in the review finally.

3. Results

3.1. Service characteristics of nurse-led cancer care programs

Totally twenty-two nurse-led cancer care programs were found (Table 1). The majority of the programs were developed in western countries, especially in Europe, including eight in UK [19–26], two in Sweden [27,28], one in Ireland [29], and one in the Netherland [30]. Four care programs were found in Australia [31–34]. Three were found in Canada [35–37]. Two care programs were developed in the United States [38,39]. One care program was established in Hong Kong [40].

Patients in these reviewed care programs were with several common cancer diagnoses. Seven care programs served patients with single diagnosis, including breast cancer [24,35], prostate cancer [19,20,34], colorectal cancer [21,22,32], and lung cancer [26]. Four care programs were designed for patients with cancers in the same specialty, including two programs for hematological malignancies [31,36], two programs for head and neck cancer ([25,30], and one program for gynecological cancers [39]. The diagnoses of the cancer patients in eight programs were heterogeneous [23,27–29,33,37,38,40].

The service provided in the reviewed care programs almost covered the whole cancer trajectory. Twelve (54.5%) of the 22 care programs were for cancer patients undergoing treatment: two were delivered in peri-operative period [24,35], seven were for chemotherapy [21–23,29,33,39,40], and three were for radiotherapy [20,25,27]. In six care programs, supportive care was provided for cancer survivors who finished treatment, but not as alternative of conventional medical follow-up [19,26,30–32,36]. There was one palliative care program for patients with advance stage cancer [38], one for cancer patients in community [37], and two for cancer patients both in treatment and after treatment who visited oncology outpatient clinic [28,34], respectively.

3.2. Study design

Among the 22 reviewed care programs, 13 were the existing services in the institutes [19–22,25–29,31,33,34,37]. Regarding the articles of these existing services, satisfaction with the nurse-led care were reported in five articles [19,22,26,28,29]. The details of the nurse-led services were introduced in four articles [22,26,27,31]. Quasi-experimental design was adopted to evaluate the effects of three care programs [21,25,37]. In two articles, the health care utilization of the patients receiving the nurse-led care were reviewed [33,34]. One article reported the feasibility and acceptability of the nurse-led service [20]. The sample size in these articles ranged from 36 to 962. The sample in three articles were more than 100.

The other reviewed articles were research programs. Five programs were randomized controlled trials (RCTs) to examine the effects of the nurse-led care programs [23,24,30,38,39]. The sample size of these studies ranged from 108 to 279. One report [32] was the protocol of a RCT of the nurse-led care after conducting a pilot study with 10 patients, introducing the study design of the RCT [41]. Three articles reported the pilot studies of the nurse-led care programs to test the feasibility and acceptability of these care programs [35,36,40]. The sample sizes of these pilot studies ranged from 4 to 45.

3.3. Structure analysis of nurse-led care programs

Structure of nurse-led care refers to the description of nurses who deliver the nurse-led care, including education level, certification, position title, working duration, training status [14], and the design of the nurse-led care.

3.3.1. The description of nurses

The majority of the reviewed care programs described nurses' characteristics in certain degree except three care programs (Table 1) [22,28,29]. The positions of nurses were most frequently reported in 19 care programs, including "clinical nurse specialist", "advanced practice nurse (APN)", "nurse practitioner", "nurse consultant", "specialist/specialized nurse", "breast care nurse", and experienced nurses working in relative areas. The number of nurses was the second common item reported, which ranged from one to eighteen.

The other four items were reported in a few care programs. Before the nurse-led care was delivered, the nurses in seven care

[1] A few articles reported the same nurse-led care program from different perspectives. Therefore, the number of articles was larger than the number of the nurse-led care programs.

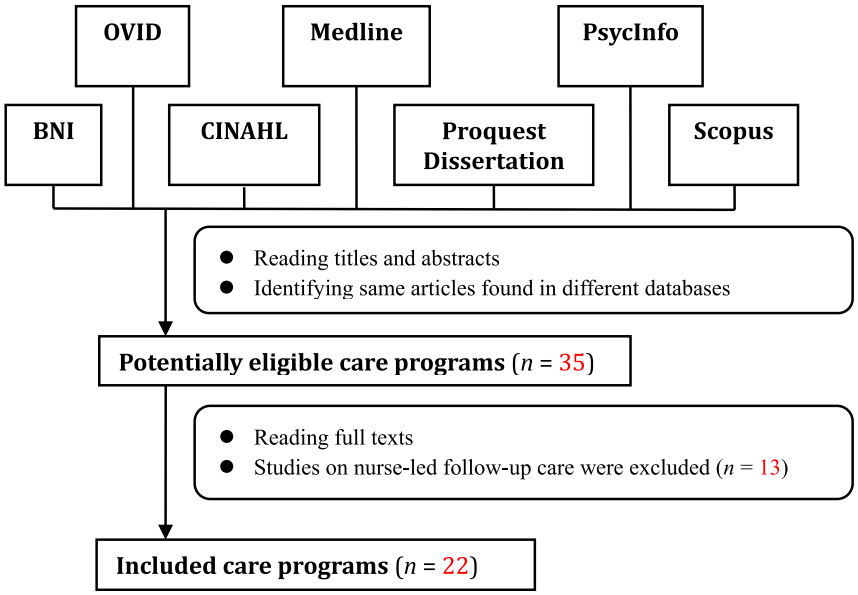

Fig. 1. Article searching and screening flowchart.

programs received training [21,23,27,30,32,38,40]. The working experiences of the nurses were reported in two care programs, which ranged from two to seventeen years [31,37,40]. The education level of the nurses was reported in one program. The nurses in this program had Master degree or PhD degree [27]. The nurses in another program got certifications in relative areas [35].

3.3.2. The design of the nurse-led cancer care programs

The design of a nurse-led care program consisted of two aspects: the approach to deliver the care (i.e. face-to-face or telephone) and the arrangement of the care (i.e. the total number of intervention sessions, the duration of the care, and the frequency of intervention sessions).

3.3.2.1. The approach to deliver the care. The delivery of the care varied in the review care programs (Table 2). Face-to-face and telephone approaches were used separately or together in these care programs. Both approaches were adopted in eight care programs [23,24,32,34,37–40]. The face-to-face approach was used in ten programs [22,25–31,33,35]. The other four programs adopted telephone approach only [19–21,36]. According to these care programs, face-to-face approach or the combined approach were common.

3.3.2.2. The arrangement of the care. The arrangement of a nurse-led care program mainly referred to the total number of intervention sessions, the duration of the care, and the frequency of intervention sessions.

Among the 22 nurse-led care programs, three were single-session programs [20,31,36]. The number of intervention sessions in two care programs was flexible which depended on the patient's requirement [26,37]. The other 17 care programs consisted of multiple intervention sessions. In the care programs with multiple intervention sessions, the care duration was fixed, which lasted for weeks to months [21,23,30,32,39,40] or covered a certain treatment period [22,24,25,29,33]. The care in four care programs continued as the patients were alive or had problems [19,34,35,38]. The duration of the other four care programs was not mentioned [26–28,37].

In most care programs with multiple intervention sessions, the intervention frequency was fixed which ranged from every three days to every year. A common character was that more frequent intervention sessions were arranged at the beginning and less frequent in the latter part of the care. In three care programs [26,33,37], intervention sessions were flexible which depended on the patient's requirement.

The care duration and frequency of the reviewed care programs were mainly determined by the time and the treatment nature. For example, for cancer patients receiving chemotherapy or radiotherapy, the nurse-led care usually covered the entire treatment phase, and each intervention session matched each hospital visit for treatment. For the nurse-led care programs for patients in post-treatment period or at the end of life stage, the care duration was depended on the frequency of medical follow-up, patient's status, or patient's requirement.

3.4. Process analysis of the nurse-led care programs

Process refers to nursing activities delivered in a nurse-led care program [14]. The nursing activities introduced in the reviewed programs were analyzed in this part. Based on the classification of nursing activities proposed by previous researchers [11,14,16], a evaluation form was developed for process analysis (Table 3). In this form, ten nursing activities were included. Each nursing activity was classified into several levels.

The process analysis of the reviewed care programs is listed in Table 4. Among the 22 care programs, there were minimal three and maximal eight nursing activities included in one care program. The average number of nursing activities involved in a care program was six. The most common nursing activity in the reviewed programs was assessment which was performed in all of the care programs (100%). Consultation and education was the second common activity (95.5%), which was followed by continuous care (86.4%), referral (77.3%), and autonomy and decision making (72.7%). More than half of the care programs (54.5%) had practice protocols. Other activities, including initiating and interpreting diagnostic test (27.3%), technical skills (18.2%), and prescription (13.6%), were performed in a few care programs. Only one care program mentioned that the nurse practitioner could prescribe drugs for patients receiving chemotherapy [33]. Discharge was not included in all of the care programs. The process analysis revealed

Table 1
The reviewed nurse-led cancer care programs.

No.	Author; Year [Reference No.]; Country	Service characteristics 1. Clients; 2. Disease phases covered by the care; 3. Essence of care; 4. Program type;	Study design 1. Study type; 2. Study objectives; 3. Sample size	Structure of nurse-led care 1. Saff size; 2. Position title; 3. Educational level; 4. Certification; 5. Working duration (y); 6. Training status
1	Anderson (2010) [19] UK	1. Prostate cancer patients; 2. Post-treatment; 3. A nurse-led telephone follow-up care for prostate cancer patients based on Prostate-specific antigen level; 4. Existing service;	1. Prospective non-experimental study; 2. To evaluate patients' satisfaction with the care program; 3. $N = 46$	1. $N = 1$; 2. Clinical nurse specialist
2	Booker et al. (2004) [20] UK	1. Prostate cancer patients; 2. Post-radiotherapy; 3. A care program to screen and management acute side-effects after radiotherapy; 4. Pilot of existing service;	1. Prospective non-experimental study; 2. To examine the acceptability and feasibility of the nurse-led service; 3. $N = 36$	1. $N = 1$; 2. Clinical nurse specialist
3	Craven et al. (2013) [21] UK	1. Colorectal cancer; 2. First two cycles of chemotherapy; 3. A nurse-led telephone follow-up program; 4. Existing service;	1. Quasi-experimental study (historical control design); 2. To examine the effects of the nurse-led telephone follow-up; 3. $N = 298$	1. $N = 2$; 2. Specialist nurse; 6. Pre-intervention training
4	MacLeod et al. (2007) [22] UK	1. Colorectal cancer patients; 2. In-chemotherapy; 3. A nurse-/pharmacy-led Capecitabine clinic; 4. Existing service;	1. Prospective non-experimental study; 2. To introduce the service and report patients' satisfaction with care; 3. $N = 52$	Not mentioned
5	Molassiotis et al. (2009) [23] UK	1. Breast/colorectal cancer patients; 2. In-chemotherapy; 3. A nurse-led home-based symptom management program; 4. Research program;	1. Experimental study (one-center RCT); 2. To examine the effect of a symptom-focused home care program for patients receiving oral Capetitabine; 3. $N = 164$	1. $N = 5$; 2. Nurse; 6. Pre-intervention training
6	Wells et al. (2004) [24] UK	1. Breast cancer patients; 2. Post-operation; 3. A nurse-led early discharge program after surgery; 4. Research program	1. Experimental study (one-center RCT); 2. To examine the effect of a nurse-led early discharge program; 3. $N = 108$	2. Breast care nurse
7	Wells et al. (2008) [25] UK	1. Head & neck cancer patients; 2. In-radiotherapy; 3. A nurse-led on treatment review; 4. Existing service	1. Quasi-experimental study (historical control design); 2. To test the effect of nurse-led on treatment review; 3. $N = 47$	1. $N = 1$; 2. Nurse specialist
8	Williamson et al. (2007) [26] UK	1. Lung cancer patients; 2. Post-treatment; 3. A nurse-led post-treatment supportive care program; 4. Existing service	1. Prospective non-experimental study; 2. To introduce the service and report patients' satisfaction with care; 3. $N = 40$	1. $N = 1$; 2. Nurse specialist
9	Dunberger & Bergmark (2012) [27] Sweden	1. Heterogeneous cancer patients; 2. Post-radiotherapy; 3. A nurse-led care program to manage gastrointestinal side-effects; 4. Existing service	1. Non-research article (service introduction); 2. To describe the development and caring activities in the nurse-led clinic; 3. $N = 60$	1. $N = 2$; 2. Oncology specialist nurse; 3. PhD & MSc; 6. Pre-intervention training
10	Berglund et al. (2015) [28] Sweden	1. Heterogeneous cancer patients; 2. In curative, adjuvant or palliative treatments; 3. Nurse-led outpatient clinics to support patients visiting OPD; 4. Existing service	1. Descriptive study (cross sectional design); 2. To examine patients' satisfaction with the care; 3. $N = 962$	Not mentioned
11	Egan & Dowling (2005) [29] Ireland	1. Heterogeneous cancer patients; 2. In-chemotherapy; 3. A holistic nurse-led care program during chemotherapy; 4. Existing service	1.Prospective non-experimental study; 2. To examine patients' satisfaction with the nurse-led oncology day ward; 3. $N = 72$	Not mentioned
12[a]	van der Meulen et al. (2013) [30] The Netherlands van der Meulen et al. (2014) [44] The Netherlands	1. Head and neck cancer patients; 2. Post-treatment; 3. A nurse-led comprehensive supportive care program; 4. Research program	1. Experimental study (RCT); 2. To examine the effect of the nurse-led care program on depressive symptom; 3. $N = 205$ 1. Experimental study (RCT); 2. To examine the long −term effect of the nurse-led care program on depressive	1. $N = 3$; 2. Oncology nurse 6. Pre-intervention training

(*continued on next page*)

Table 1 (*continued*)

No.	Author; Year [Reference No.]; Country	Service characteristics 1. Clients; 2. Disease phases covered by the care; 3. Essence of care; 4. Program type;	Study design 1. Study type; 2. Study objectives; 3. Sample size	Structure of nurse-led care 1. Saff size; 2. Position title; 3. Educational level; 4. Certification; 5. Working duration (y); 6. Training status
			symptom and QOL; 3. $N = 205$	
13	Gates & Krishmasamy (2009) [31] Australia	1. Hematological malignancies patients; 2. Post-treatment; 3. A nurse-led consultation to manage late side-effects of treatment; 4. Existing service	1. Non-research article (service introduction); 2. To introduce the nurse-led consultation in a multi-discipline late effect clinic	1. $N = 1$; 2. Nurse consultant; 5. 13y
14[a]	Jefford et al. (2011) [41] Australia	1. Colorectal cancer patients; 2. Post-treatment; 3. A nurse-led post-treatment supportive care program; 4. Pilot study of research program	1. Quasi-experimental study (pre-post test design); 2. To examine the feasibility of the care program; 3. $N = 10$	1. $N = 1$; 2. Nurse coordinator; 6. Pre-intervention training
	Jefford et al. (2013) [32] Australia	4. Study protocol;	1. Experimental study (multi-center RCT); 2. To examine the effectiveness of the program	1. $N = 18$ and above; 2. Specialist colorectal cancer nurse/nurses with experience; 6. Pre-intervention training
15	Cox et al. (2013) [33] Australia	1. Heterogeneous cancer patients; 2. In-chemotherapy; 3. A nurse-led supportive care program; 4. Existing service	1. Descriptive study (audit); 2. To review the heath care utilization of the service; 3. $N = 72$	1. $N = 1$; 2. Nurse practitioner;
16	Birch et al. (2016) [34] Australia	1. Prostate cancer patients; 2. Peri-operation and post-treatment follow-up; 3. A nurse-led robotic prostatectomy care pathway; 4. Existing service	1. Descriptive study (audit); 2. To assesses patients' satisfaction and health care utilization; 3. $N = 124$	1. $N = 1$; 2. Nurse specialist
17	Howell & Watson (2005) [35] Canada	1. Breast cancer patients; 2. Post-operation; 3. A nurse-led community based lymphedema care program; 4. Pilot study	1. Quasi-experimental study (pre-post test design); 2. To examine the effect of a community-based treatment program for lymphedema; 3. $N = 4$	1. $N = 1$; 2. Specialized oncology nurse; 4. Certification in manual lymphatic drainage treatment
18	Overend et al. (2008) [36] Canada	1. Hematology malignancies patients; 2. Post-treatment; 3. A nurse-led follow-up care program; 4. Pilot study	1. Prospective non-experimental study; 2. To introduce the development of a nurse-led telephone follow-up care program and report patient's satisfaction; 3. $N = 45$	1. $N = 1$; 2. Oncology nurse
19[a]	Howell et al. (2008) [48] Canada	1. Heterogeneous cancer patients; 2. Unspecified; 3. A nurse-led community-based supportive care program;	1. Descriptive study (mixed method); 2. To obtain an in-depth understanding of the care model and care procedure; 3. Nurse = 6; service providers = 26;	
	Sussman et al. (2011) [37] Canada	4. Existing service	1. Quasi-experimental design (pre-post test); 2. To evaluate the effect of the specialized oncology nursing care coordination program; 3. $N = 113$	2. Specialized oncology nurse; 5. 2-14y
20[a]	Bakitas et al. (2009a) [49] USA	1. Heterogeneous cancer patients; 2. Advanced stage; 3. A nurse-led palliative care program; 4. Research program	1. Non-experimental study (cross-sectional design); 2. To introduce the study protocol and report the baseline data of the subjects; 3. $N = 279$	
	Bakitas et al. (2009b) [38] USA		1. Experimental study (multi-center RCT) 2. To examine the effect of the program; 3. $N = 279$	1. $N = 3$; 2. APN & nurse practitioner; 6. Pre-intervention training
21	McCorkle et al. (2009) [39] USA	1. Gynecological cancer patients; 2. In-treatment; 3. A nurse-led supportive program after surgery and during chemotherapy; 4. Research program	1. Experimental study (one-center RCT); 2. To examine the effect of the nurse-led care program; 3. $N = 123$	1. $N = 1$; 2. APN
22	Lai et al. (2015) [40] Hong Kong	1. Breast cancer & colorectal cancer patients; 2. In-chemotherapy; 3. A nurse-led supportive care program; 4. Pilot study	1. Quasi-experimental study (pre-post test design); 2. To assess the feasibility of the nurse-led care program; 3. $N = 5$	1. $N = 3$; 2. APN; 5. 10-17y; 6. Pre-intervention training

[a] The nurse-led care program was reported in several articles. RCT: randomized controlled trial.

Table 2
The design of nurse-led care programs.

	Approach		The number of sessions	Care duration	Frequency/timing
	Face-to-face	Telephone			
Anderson (2010) [19]		Yes	Multiple	No ending	Every 3/6/12 months depend on follow-up
Booker et al. (2004) [20]		Yes	Single		6 weeks post-radiotherapy
Craven et al. (2013) [21]		Yes	Multiple (3 sessions)	2 cycles	Day 3 and 10 after 1st cycle, then day 10 after 2nd cycle
MacLeod et al. (2007) [22]	Yes		Multiple	Covered chemotherapy	Every chemotherapy ward visit
Molassiotis et al. (2009) [23]	Yes	Yes	Multiple	18 weeks	1 visit in the first week→weekly call; extra home visit when necessary
Wells et al. (2004) [24]	Yes	Yes	Multiple	Peri-operation	1 session before surgery; 1 home visit after discharge; then daily telephone call till drain removal
Wells et al. (2008) [25]	Yes		Multiple	Cover radiotherapy	Weekly visit
Williamson et al. (2007) [26]	Yes		Not mentioned	Not mentioned	Depended on the patient
Dunberger & Bergmark (2012) [27]	Yes		Multiple (1-5 sessions)	Not mentioned	Not mentioned
Berglund et al. (2015) [28]	Yes		Multiple	Not mentioned	Not mentioned
Egan & Dowling (2005) [29]	Yes		Multiple	Cover chemotherapy	Every chemotherapy ward visit
van der Meulen et al. (2013) [30]	Yes		Multiple (6 sessions)	1 year	Every two month within one year
Gates & Krishnasamy (2009) [31]	Yes		Single		Post treatment
Jefford et al. (2013) [32]	Yes	Yes	Multiple (4 sessions)	2 months	At the end of treatment→1, 3, 7 weeks after treatment
Cox et al. (2015) [33]	Yes		Not mentioned	During chemotherapy	Depended on the patient
Birch et al. (2016) [34]	Yes	Yes	Multiple	Before surgery till post treatment follow-up	Pre-operation: 2 times; On the operation day; Post-operation: day 1, 2, 4, and 10; Follow up: every 3 months for the first year →every 6 months for 5 years→ annually up to 10 years
Howell & Watson (2005) [35]	Yes		Multiple	Ended when relieved	Every 3 days (first 4 weeks)→weekly
Overend et al. (2008) [36]		Yes	Single		
Sussman et al. (2011) [37]	Yes	Yes	Flexible	Not mentioned	Depended on the patient
Bakitas et al. (2009) [38]	Yes	Yes	Multiple	No ending (as alive)	Weekly call (first 4 months)→monthly
McCorkle et al. (2009) [39]	Yes	Yes	Multiple (18 sessions)	6 months	2 times per week in the first month; 2 times per month in month 2–6
Lai et al. (2015) [40]	Yes	Yes	Multiple (3 sessions)	During chemotherapy	Pre-chemotherapy: 1 session; In-chemotherapy: 1 session after the 1st and 2nd cycle

the most common six characters of the existing nurse-led cancer care programs: assessment, consultation, continuous care, referrals, decision making, and practice protocols.

Although several nursing activities were delivered in the reviewed nurse-led care programs, it is worthy noticing that the practice level of each nursing activity was not the same. Among the three levels of assessment, the nurses mostly provided site/type-specific assessment (50.0%) and specialty-specific assessment (45.5%). Only in one program, the nurses practiced broad and first line assessment [38]. In 15 care programs with referral function, the nurses in seven care programs could make internal medical referral (41.2%). The nurses in six care programs (35.3%) could make internal referral or referral to other disciplines. The referral of external resources could be made in four care programs (23.5%). The autonomy of nurses in the nurse-led care programs was limit. The nurses usually referred the patients to medical team (68.8%) when there was a medical-related problem or cooperative problem. The nurses in three care programs could make decision under permission (18.8%). In two care programs, the nurse would discuss the problem with the physician (12.5). All the descriptions of nursing activities indicate that the existing nurse-led care programs mainly provide continuous care for cancer patients based on the assessment. Consultation and education was the main nursing activity. Besides consultation and education, referrals at certain degree could be made in the nurse-led care programs.

3.5. Outcome analysis of the nurse-led care programs

Outcomes are the consequences or end results of health care delivery [42]. Based on previous studies [14,42,43], outcomes of nurse-led care in this review were classified into four categories: (i) clinical outcomes; (ii) functional outcomes; (iii) psychological outcomes; (iv) health care system outcomes. Quantitative and qualitative methods were both adopted in seven programs [20,24–26,35,38,40]. Quantitative approach was adapted in 12 programs [19,21,23,28–30,32–34,36,37,39]. Qualitative data were collected by the interviews or the open-end questions in the questionnaires.

3.5.1. Clinical outcomes

Clinical outcomes are related to physiological functioning or process, such as morbidity, mortality, vital signs, nutrition status, symptoms, and sleep maintenance [43]. Three clinical outcome measures, including survival length [38], symptoms [23,25,35,38–40,44], and nutrition status [25], were evaluated in the reviewed programs, among which symptoms were most frequently evaluated (Table 5). The results of the symptoms were encouraging. The patients receiving nurse-led care during chemotherapy, radiotherapy, post-treatment period, and at advanced stage reported lower symptom severity, lower distress levels, and lower chemotherapy toxicity [21,23,25,35,38,39,44]. The nutrition problems of the patients undergoing radiotherapy who received

Table 3
The evaluation form of process analysis.

Evaluation item &	Description	Classification of the nursing activity
1. Practice protocol	● Was there any practice protocol in the care program?	● Half covered protocol; ● Whole covered protocol
2. Assessment	● Did the nurse assess the patient's condition?	● Site/type-specific; ● Specialty-specific; ● Broad and first line
3. Autonomy and decision making	● How did the nurse manage a medical-related problem/cooperative problem?	● Referred to doctors; ● With permission; ● In discussion; ● Autonomous
4. Referral	● Could the nurse refer a patient to other disciplines?	● No referral; ● Internal medical referral; ● Internal medical or other discipline; ● External/internal sources any types
5. Diagnostic tests & result interpretation	● Could the nurse initiate any test? ● How was the test result interpreted?	● Medically initiated; ● Joint with discussion; ● Independent decision/order (limited tests)
6. Consultation/education	● Was consultation or education included in the care program?	● Yes
7. Technical skills	● Did any technical skills involve?	● Yes
8. Prescription	● Could the nurse prescribe any medicines?	● Within clear protocol; ● Independent prescription
9. Discharge	● How was the patient discharged?	● Referred back to medical staff; ● Discharged from nurse-led service; ● Discharged from service, hospital and/or into the community
10. Care continuity	● Was the service provided to the patients continuously?	● Yes

the nurse-led care were improved comparing with the patients receiving the conventional care [25]. Encouraging results on the symptoms indicate that the nurse-led care could play an effective role in symptom management for cancer patients.

3.5.2. Functional outcomes

Functional outcomes mainly include activities of daily living (ADL), quality of life (QOL), and self-care [42,43]. QOL, post-operative complications, and self-care were evaluated as functional indicators in the reviewed programs (Table 5). The results of the QOL were incongruent. Better QOL were reported in three studies [37–39,44]; while similar QOL were found in the other five programs [23–25,32,40]. In terms of post-operative complications, one program found that the patients receiving the nurse-led care had less wound infection than the patients under the conventional care [24]. Another program found that the lymphedema of breast cancer patients relieved after they received the nurse-led care [35]. The result of self-care just showed a trend of increase after the nurse-led care [37].

3.5.3. Psychosocial outcomes

Psychological outcomes are results related to behaviors, relationships and communication, such as mental status, coping, social functioning, caregiver burden, and sexual functioning [43]. More outcomes in the psychological aspect were evaluated in the reviewed programs, including psychological distress, depression, uncertainty, self-efficacy, impact on daily life, and caregiver burden (Table 5). Jefford et al. (2011) found that the psychological distress of post-treatment colorectal cancer patients after the nurse-led care was similar to the baseline level before the nurse-led care [41]. The results of depression were inconclusive. In two RCTs, it was found that the nurse-led care had no impact on the depression of patients receiving chemotherapy [23,34]. In another RCT, the depression symptoms of head and neck cancer patients at 12 and 18 months after the completion of treatment were significantly lower in the nurse-led care group than in the control group [44]; the other RCT reported that the patients in the nurse-led palliative care had lower depressed mood than the patients in the conventional care [38]. In addition, McCorkle et al. (2009) found that the patients had less uncertainty [39]. Lai et al. (2015) reported similar self-efficacy before and after receiving the nurse-led care in the pilot study [40]. The impact on daily life was evaluated in a community-based nurse-led care program for breast cancer patients with lymphedema [35]. Less daily impact (i.e. household tasks, daily activities, social activities etc.) was found after the patients receiving the nurse-led care [35]. In another study, no impact on caregiver burden during post-treatment phase was reported [24].

3.5.4. Health care system outcomes

Health care system outcomes consist of care cost, health care utilization, and satisfaction with care [43]. Three types of health care system outcomes were evaluated in the reviewed programs: health care utilization, satisfaction with care, and care coordination (Table 5). Six indictors of health care utilization were evaluated. Wells et al. (2008) found that the patients in the nurse-led care group had longer and more consultations but less waiting time during the radiotherapy [25]. Fewer additional telephone calls to the hospital and home visits were found in another two programs [23,37]. Wells et al. (2004) found fewer surgical cancellations among the patients receiving the nurse-led care [24]. The results of hospital length and visits to emergency room were inconclusive. The hospital length of the patients with advanced stage cancer receiving the nurse-led care and those receiving the conventional care were similar in Bakitas et al.'s (2009) study [38]; while the hospital length of the patients receiving chemotherapy in the nurse-led care were shorter than those in the conventional care in Molassiotis et al.'s (2009) study [23]. Bakitas et al. (2009) also found no significant differences on the visits to emergency room between the patients receiving the nurse-led care and those receiving the routine care [38]. Fewer visits to emergency room were reported among the cancer patients after they received the community-based nurse-led care [37].

In general, the satisfaction with the nurse-led care was good. The patients receiving the nurse-led care during radiotherapy had less negative comments [25]; while the patients receiving the nurse-led early discharge care and the patients receiving the

Table 4
The analysis of nursing activities in the nurse-led care programs.

Name of the care program - The number of nursing activities in the program	1. Practice protocol - Range; - Content; - Resource	2. Assessment	3. Autonomy & Decision making 4. Referral 5. Diagnostic tests & result interpretation	6. Consultation/education 7. Technical skills 8. Prescription	9. Discharge 10. Care continuity
Anderson (2010) [19] - 7 activities	- Whole covered; - Practice guideline; - Not mentioned	Site/type-specific	3 In discussion 4 Internal medical referral 5 Initiate/interpret one test (PSA)	6 Not mentioned 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Booker et al. (2004) [20] - 5 activities	- Not mentioned; - Not mentioned; - Not mentioned	Site/type-specific	3 Refer to doctors 4 Internal medical referral 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 No
Craven et al. (2013) [21] - 7 activities	- Whole covered; - Protocol of symptom treatments; - Not mentioned	Site/type-specific	3 With permission 4 External community services 5 Not mentioned	6 Yes 7 Not mentioned 8 With clear protocol	9 Not mentioned 10 Yes
MacLeod et al. (2007) [22] - 8 activities	- Whole covered; - Not mentioned; - Not mentioned	Site/type-specific	3 Refer to doctors 4 Internal medical referral 5 Initiate and interpret limited tests	6 Yes 7 Not mentioned 8 With clear protocol	9 Not mentioned 10 Yes
Molassiotis et al. (2009) [23] - 6 activities	- Whole covered; - Symptom management protocol; - Evidence based	Specialty-specific	3 Refer to doctors 4 Internal medical referral 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Wells et al. (2004) [24] - 4 activities	- Not mentioned	Site/type-specific	3 Not mentioned 4 Not mentioned 5 Not mentioned	6 Yes 7 Yes 8 Not mentioned	9 Not mentioned 10 Yes
Wells et al. (2008) [25] - 8 activities	- Whole covered; - Symptom management protocol; - Existing literature	Site/type-specific	3 With permission 4 Internal medical referral 5 Initiate and interpret limited tests	6 Yes 7 Not mentioned 8 With clear protocol	9 Not mentioned 10 Yes
Williamson et al. (2007) [26] - 5 activities	- Not mentioned	Site/type-specific	3 Refer to doctors 4 Internal medical/other discipline 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Depended
Dunberger & Bergmark (2012) [27] - 7 activities	- Half covered; - Guideline for medical treatment of gastrointestinal symptoms; - Previous studies	Specialty-specific	3 With permission 4 Internal medical/other discipline 5 Initiate limited tests	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Depended
Berglund et al. (2015) [28] - 3 activities	- Not mentioned; - Not mentioned; - Not mentioned	Specialty-specific	3 Not mentioned 4 Not mentioned 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Egan & Dowling (2005) [29] - 6 activities	- Not mentioned; - Not mentioned; - Not mentioned	Specialty-specific	3 Refer to doctors 4 Internal medical referral 5 Not mentioned	6 Yes 7 Yes 8 Not mentioned	9 Not mentioned 10 Yes
van der Meulen et al. (2013) [30] - 5 activities	- Whole covered; - Intervention manual; - Not mentioned	Site/type-specific	3 Not mentioned 4 Internal medical/other discipline 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Gates & Krishnasamy (2009) [31] - 4 activities	- Whole covered; - Care pathways and protocols; - Evidence based	Specialty-specific	3 Not mentioned 4 Internal medical/other discipline 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 No
Jefford et al. (2013) [32] - 6 activities	- Whole covered; - Intervention manual; - Developed by experts after research	Specialty-specific	3 Refer to doctors 4 External/internal source any types 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Cox et al. (2013) [33] - 5 activities	- Not mentioned; - Not mentioned; - Not mentioned	Specialty-specific	3 In discussion 4 Not mentioned 5 Independent decision/order	6 Yes 7 Not mentioned 8 Yes, but did not described clearly	9 Not mentioned 10 Depended
Birch et al. (2016) [34] - 6 activities	- Not mentioned; - Not mentioned; - Not mentioned	Site/type-specific	3 Referred to doctors 4 External/internal source 5 Independent order (limited test)	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Howell & Watson (2005) [35] - 4 activities	- Not mentioned; - Not mentioned; - Not mentioned	Site/type-specific	3 Not mentioned 4 Not mentioned 5 Not mentioned	6 Yes 7 Yes 8 Not mentioned	9 Not mentioned 10 Yes

(*continued on next page*)

Table 4 (*continued*)

Name of the care program - The number of nursing activities in the program	1. Practice protocol - Range; - Content; - Resource	2. Assessment	3. Autonomy & Decision making 4. Referral 5. Diagnostic tests & result interpretation	6. Consultation/education 7. Technical skills 8. Prescription	9. Discharge 10. Care continuity
Overend et al. (2008) [36] - 6 activities	- Half covered; - Interview guide; - Not mentioned	Site/type-specific	3 Refer to doctors 4 Internal medical referral 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Sussman et al. (2011) [37] - 6 activities	- Not mentioned; - Not mentioned; - Not mentioned	Specialty-specific	3 Refer to doctors 4 External/internal source type 5 Not mentioned	6 Yes 7 Yes 8 Not mentioned	9 Not mentioned 10 Yes
Bakitas et al. (2009) [38,39] - 6 activities	- Half covered; - An educational manual; - Previous studies & public available source	Broad & first line	3 Refer to doctors 4 Internal medical/other discipline 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
McCorkle et al. (2009) [39] - 3 activities	- Not mentioned; - Not mentioned; - Not mentioned	Specialty-specific	3 Not mentioned 4 Not mentioned 5 Not mentioned	6 Yes 7 Not mentioned 8 Not mentioned	9 Not mentioned 10 Yes
Lai et al. (2015) [40] - 6 activities	- Whole covered; - Care procedure and practice protocols - Evidence-based	Specialty-specific	3 Referred to doctors 4 Internal medical/other discipline 5 No	6 Yes 7 No 8 No	9 No 10 Yes

conventional care had similar satisfaction with care [24]. The studies without control groups reported that the satisfaction with care was at high level [19–21,26,28,29,34,36,40].

Care coordination referred to other external health care providers/institutes which cooperated with the nurse-led care in the reviewed care programs, such as dentist, primary practitioner, and community nurses in this review. A few programs examined the impact of the nurse-led care on other health care providers. Two programs found that the patients receiving the nurse-led care had less visits to other health care providers [23,37]. In the nurse-led early discharge care program cooperating with community nurses, the workload of community nurses was increased [24]. Promising feedback was obtained from other health care providers/organizations. In Sussman et al.'s (2011) study, other health care providers' knowledge about the patients, coordination of care, and the interpersonal communication tended to increase after the nurse-led care program [37]. Only one study explored the impact on non-health care organization and found no impact on peer support group [37]. In addition to the outcome measures mentioned above, two programs found that the patients had less needs after the nurse-led care [32,37].

3.6. Association among structure, process, and outcomes

When the structure, process, and outcomes of the reviewed nurse-led cancer care programs were examined together, it was interesting to note that no conclusion could be made on how structure and process led to the encouraging outcomes. Among the studies with encouraging results, especially the five RCTs with positive results, the structures and processes of these care programs were different. For example, the intervention nurses in the four care programs included APNs [38,39], nurse practitioners [38], nurses [23], and breast cancer nurses [24]. The nurses in three care programs received training before the care was delivered [23,30,38]. Among the ten nursing activities, only three to eight nursing activities were delivered in these programs. The only common feature shared by the five care programs was that continuous care was provided through multiple intervention sessions. The essential components of a successful nurse-led cancer care are still unclear. To date, the suggestion "more detailed studies are required because the dynamic effects on nurse-led care are complex" [12] is still a direction for future research on nurse-led cancer care.

4. Discussion

Nurse-led care has been explored in oncology settings in increasing studies during the past years. Undoubtedly, nurse-led follow-up care as an alternative for the conventional follow-up care has been so frequently examined that relevant review articles have been published [17,18]. Besides the nurse-led follow-up care, other nurse-led cancer care programs have been developed as well, which cover the majority of cancer trajectory and patients with several cancer diagnoses. However, comparing with the enthusiasm for the nurse-led follow-up care, more efforts on nurse-led care in other oncology settings are needed in future. Such efforts include developing nurse-led care programs outside Europe and more nurse-led care programs for each phase of the cancer journey.

Although some articles on nurse-led cancer care have been found, further research is still required to evaluate this care model. Lewis et al. (2009) highlight that it is imperative to look rigorously and creatively to evaluate nurse-led clinics in cancer area for further development [18]. This review supports Lewis et al.'s [18] opinion. Existing evidence demonstrates that the nurse-led cancer care is applicable and safe among several cancer populations, additional research is still needed to determine its clinical impact and effectiveness [45]. Among the reviewed care programs, RCT design was only adopted in a few studies. The results from the RCTs and other quasi-experimental studies were not adequate enough to demonstrate the effectiveness and clinical impacts of the nurse-led cancer care.

Meanwhile, the inconclusiveness among most of the outcome indicators also requires more studies on this topic. Among various outcome indicators adopted in the reviewed programs, better symptom control was identically reported in several programs [21,23,25,30,38,39]. For other outcomes, no conclusion can be made. The heterogeneity of cancer populations, treatment, diagnoses, and study designs may all contribute to the inconclusiveness. Obviously, more studies with rigorous design are in great need in future.

Besides studies with rigorous design, how to evaluate existing nurse-led care programs also brings challenges to nursing

Table 5
The outcome analysis.

	Nurse-led group vs. control group[a]	Pre-IT vs. post-IT[b]	Cross sectional
Clinical outcomes			
Survival length	= [38*]		
Symptoms	> Lower severity [38*]; Lower distress [39*]; Less chemotherapy toxicity [21, 23*] Oral problem [25, 44*] Pain [25, 44*] Less fatigue [44*]	Hair loss, fatigue, appetite change and weight change were most common since the chemotherapy began [40]	69% patients reported one problem, and most symptoms were at moderate to several level [33]
Nutrition status	> Nutritional problems [25]		
Functional outcomes			
QOL	> [38*, 39*, 44*]	> [37]	
	= [23*, 24*, 25]	= [40,41]	
Post-operative complications	> Seroma aspirations & wound infection [24*]	> Arm volume [35]	
Self-care		> Trend [37]	
Health care system outcomes			
Resource utilization			
(1) Number of interactions	< More sessions [25]		
(2) Duration of interaction	< Longer duration [25]		10–30 min for most patients [33]
(3) Waiting time	> Less waiting time [25]		The median waiting time was 5 min [33]
(4) Additional hospital visits to/home visits/telephone service	> Fewer telephone calls [23*]) Fewer surgical cancellation [24*]	> Fewer home visits [37] The hotline calls, General Practitioner visits, and admissions were low [21]	40% was admitted to hospital, 18% were reviewed the second time within 7 days [33]
(5) Hospital days of hospitalization	= [38*]		Median = 4 days [33]
	> Shorter duration [23*]		
(6) Visits to emergency department	= [38*]	> Fewer visits [37]	
Satisfaction with care	> Fewer negative comments [25]	The satisfaction level with care was high [19–21,26,29,36,40]	Patients' satisfaction was generally high [28,34]
	= [24*]		
Care coordination	The program increased the work load of community nurse who cooperated with the study hospital [24*]	Other health care providers' knowledge about patients, coordination of care, and the interpersonal communication tended to increase after intervention [37]	
	> Fewer use of other health care providers/organizations [23*]	> Fewer visits to pharmacist/family physician/allied health care providers [37]	31% needed to see a urologist, 15% were referred to psychologist, 35% were referred to the nurse-led sexual health clinics, 35% were referred to a physiotherapist [34] 30% needed medical advice, 14% was reviewed by the doctors [33]
		= Self-help and support group [37]	
Psychosocial outcomes			
Psychological distress		= [41]	
Depression	> [38*,44*]		
	= [23*, 39*]		
Uncertainty	> [39*]		
Self-efficacy		= [40]	
Daily life impact		< [35]	
Carer burden	= Time taken off work & impact on carer [24*]		
Other outcomes			
Needs		> Less needs [37,41]	

* Results from RCT.
[a] For two groups comparison: (=): no difference between two groups; (>): patients in the nurse-led care group had better condition; (<): patients in the control group had better condition.
[b] For one group comparison: (=): patients' condition unchanged after intervention; (>): patients' condition improved after intervention; (<): patients' condition worsened after intervention.

professionals. Among the reviewed care programs, there are more articles about existing services than research projects. In a survey conducted in the west of Scotland, over eighty cancer nurse-led clinics were identified [46]. In fact, more nurse-led services may exist in clinical settings than those reported in the literature. The scientific evaluation of the nurse-led services is behind the establishment of such services. Since these care programs are existing ones, it may be difficult to evaluate the effects with rigorous study design. Audit or quasi-experimental design have been commonly adopted for evaluation, which limits the choice of outcome indicators and the level of scientific evidence which could be provided. As a result, satisfaction with care is commonly evaluated.

In the recently published articles of the existing nurse-led services, some outcome indicators of health care utilization were adopted, such as waiting time, consultation time, additional hospital visits, hospital days, referral records, etc. [28,33,34] Indictors

of health care utilization have been paying more attention when evaluating the nurse-led care programs because it could provide influential evidence for policy makers or institute directors when the nurse-led services are reviewed. In future, how to evaluate the existing service effectively is a valuable topic. Not only nursing-sensitive outcome indicators, but also health care system-benefit outcome indicators should be considered, such as waiting time, QOL, appropriateness and frequency of referral back to medical stuff, and symptom management are all alternative options [46].

Not only exploring the acceptability of nurse-led cancer care in wider areas and demonstrating the effectiveness of nurse-led cancer care are two important tasks in future, but also analyzing the reasons for the success of the nurse-led care programs is another important task. In this review, the structures and processes of the nurse-led care programs were analyzed. However, the descriptions of the two aspects were not adequate; especially the structures of these care programs. Usually, how to implement the care is required to describe precisely in the methods part of an article. Due to the word limitation of publication, detailed procedure of the intervention cannot be fully obtained from the published articles. Hutchison et al. (2011) also found that only a few articles analyzed the practice of nurse-led care [46]. How and who deliver the care are essential to understand the outcomes of a nurse-led care program. In future, more information on the structure and process of a nurse-led care program should be clearly introduced.

Besides the inadequate descriptions of structure and process, discrepancies were found among the structure, process, and outcomes. The findings may not be in agreement with the key components proposed by other researchers [11,16]. Some reviewed care programs with encouraging outcomes were delivered by non-APNs without practice protocols. Meanwhile, the practice levels of the reviewed nurse-led care programs varied, among which not all key activities proposed by Richardson and Cunliffe (2003) [11] were involved. Comparing with Hutchison et al.'s review (2011) [46], the practice levels of the reviewed nurse-led care programs still have room to improve. One possible reason is that some reviewed care programs were research projects not existing services. More constraints may exist for research projects, for example, level of autonomy. The discrepancy indicates that there are other underlining factors contributing to the success. Only one reviewed program analyzed the reasons for its success. McCorkle et al. (2009) thought that the success contributed to the APNs' individualized and continuous care [39]. Allowing family involvement and facilitating communication with medical professionals are also important factors [39]. Shiu, Lee, and Chau (2012) also point out that the elements to good advanced nursing practice remain unclear. Identifying important components of nurse-led cancer care is another puzzle faced by nursing professionals [47].

5. Conclusion

This scope review summarized the articles of nurse-led cancer care published during the past more than ten years. Twenty-two nurse-led care programs were reviewed. Most of these care programs were developed in western countries, which served patients with several common cancer diagnoses during the whole cancer trajectory. Half of these care programs were for cancer patients in the treatment period.

The descriptions of nurses who delivered the nurse-led care were incomprehensive. The positions and the number of nurses were most reported. Face-to-face and combined methods (i.e. fact-to-face and telephone) were common approaches to deliver the care. The durations and frequencies of the nurse-led care programs varied which were mainly determined by the time and the treatment nature. Among the ten nursing activities evaluated in this review, minimal three activities and maximal eight activities were included in one nurse-led care program. The most common nursing activities were assessment, consultation, continuous care, referrals, and care with practice protocols.

Encouraging results of some outcome measures have been found in some programs, which suggests that the nurse-led care programs could benefit cancer patients and health care institutes. Cancer patients had more consultations with nurses with less waiting time. They also had longer communication. Although it is difficult to draw conclusion on each outcome indicator due to inadequate studies, superior or similar results have been reported in the reviewed care programs in general, which indicates that nurse-led care is acceptable and safe for cancer patients. Some care programs are also effective for certain cancer populations.

This review may have excluded studies with interventions developed by nurses and may not be named as nurse-led care. In future reviews, search targeting on specific problems and interventions could be conducted to provide insights on cancer care. Great effort is needed in the following directions in future: testing the feasibility of the nurse-led care programs outside of Europe, developing more studies to evaluate the effects of nurse-led services for patients in each phase of the cancer journey, evaluating existing nurse-led services. Studies with rigorous design and nursing sensitive and health care system-benefit outcomes are needed to meet these challenges. Meanwhile, the research to explore the essential components of successful nurse-led cancer care is in great need in future since no clear association among structure, process and outcomes have been found based on the reviewed care programs.

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Author contributions

LAI was responsible for conducting the literature review and drafting the manuscript. All of the three authors involved in planning, reviewing, discussing, and reporting the final manuscript. LAI takes responsibility for the paper as a whole.

Conflict of interest

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.ijnss.2017.02.001.

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