

Review

Curriculum design and attrition among undergraduate nursing students: A systematic review

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ABSTRACT

Attrition rates among nursing students are a global issue, and a possible factor in current nursing shortages. Numerous studies have been conducted to determine why students drop out of nursing programmes. The limitations of previous studies have included overly small sample sizes, being largely descriptive, and not focusing on attrition as an outcome. The aim of this study is to review the issue of attrition among undergraduate nursing students in relation to curriculum design. Five electronic databases, namely CINAHL, Medline, Cochrane Library, British Nursing Index, and PsycINFO, were adopted. Using the Population-Intervention-Comparison-Outcome model, search terms were identified, such as ‘student nurse’, ‘undergraduate programme’, ‘curriculum design’, and ‘attrition’. Mixed Method Appraisal Tools were used to evaluate the methodological quality of the identified research papers. A total of 16 publications were reviewed and four themes were identified: pre-enrolment criteria for recruiting nursing students; curriculum content; clinical placement-related policies; and student support services. Institutional-level risk factors that could be reduced were identified, including academic failure, poor clinical performance, stress, and unrealistic expectations of nursing. This review gives insights into how a curriculum for undergraduate nursing programmes can be designed that will engage students and increase the nursing workforce.

1. Background

Nurses play a significant role in healthcare systems. According to the World Health Organization (2018), nurses and midwives comprise nearly 50% of the global health workforce. They provide primary care and treatment to patients, educate the public about the importance of health in the community, and participate in controlling diseases and infections (World Health Organization, 2018). Therefore, the importance of nursing education and training cannot be overemphasized. Today, most registered nurses are trained in universities, where the emphasis is on critical thinking, leadership, systems analysis, and teamwork (American Association of Colleges of Nursing, 2016; The Nursing Council of Hong Kong, 2016). Students need to complete a bachelor's degree to become registered nurses.

However, a significant number of students worldwide drop out from undergraduate nursing programmes (ten Hoeve et al., 2017). Hence, the complex reasons behind such attrition need to be investigated, such as personal, institutional, course-related, and financial factors (Urwin

et al., 2010). Of these, it is practical to explore the design of the undergraduate nursing curriculum, because it can potentially be modified and improved so that students can better enjoy and appreciate their learning experience (Taylor, 2005). This will encourage more students to complete their nursing programme and increase the supply of nurses, easing the burden on public healthcare systems.

1.1. Design of the Undergraduate Nursing Curriculum

Curriculum design is defined as ‘all educational experiences that learners have in an educational programme, the purpose of which is to achieve goals and objectives that have been developed within a framework of theory and research, past and present professional practice, and the changing needs of society’ (Parkay et al., 2014). Mooring (2016) showed that curriculum design is closely related to the retention of nursing students.

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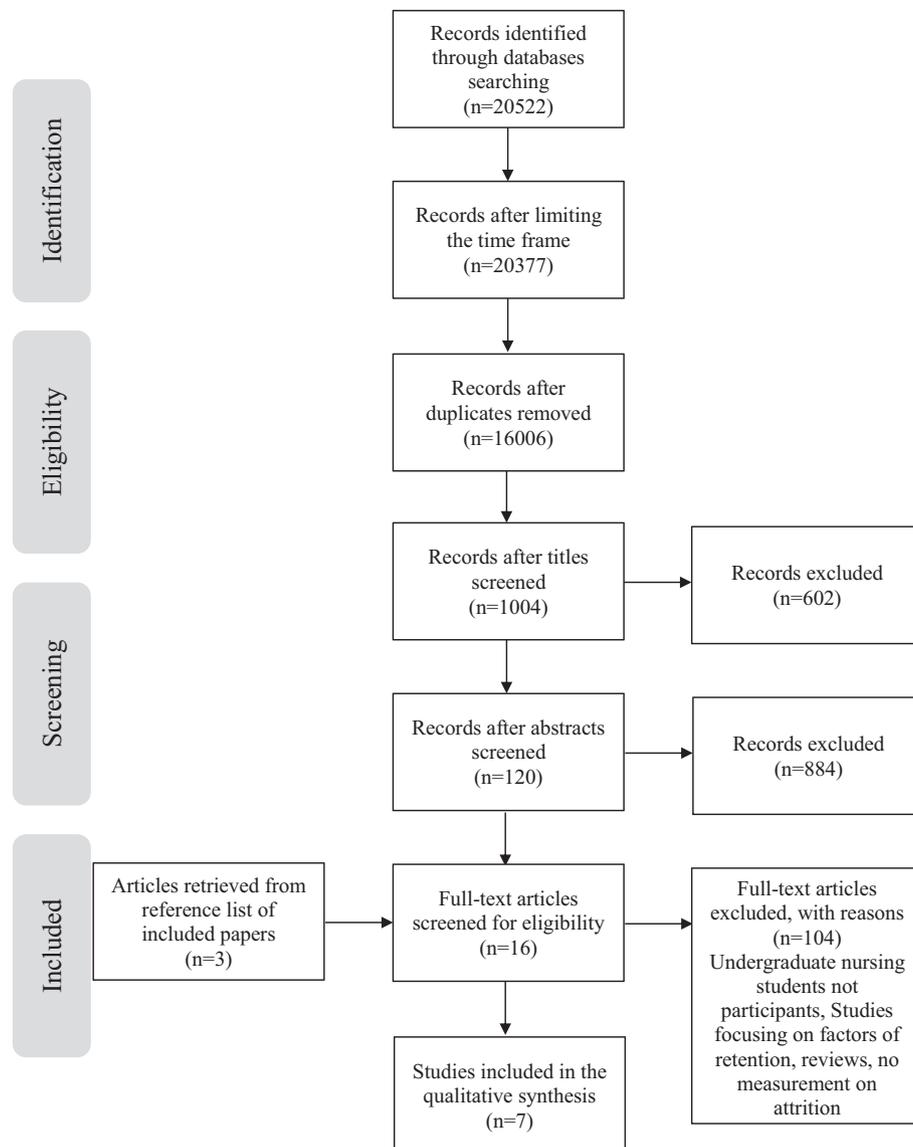


Fig. 1. PRISMA flowchart.

1.2. Significance of Nurse Attrition

Nursing shortages are a globally recognized issue because of ageing populations and escalating demands on healthcare services. In Hong Kong, the nurse-to-patient ratio in hospitals is 1:11 in the daytime shift, far higher than the international standard of 1:6 (Department of Health, 2016). One reason for the shortage of nurses is attrition in undergraduate nursing programmes. The attrition rate is about 25% in Britain (Fowler and Norrie, 2009), 24.5% in Australia (Gaynor et al., 2007), and 50% in some nursing programmes in the United States (Brown and Marshall, 2008). In Hong Kong, it is about 5% (Watson et al., 2008). Although this figure is comparatively low, it still contributes to recent and future shortfalls of nurses in hospitals (Stewart et al., 2006). Cameron et al. (2011) suggested that nurse shortages are also associated with staff dissatisfaction, leading to attrition after qualification, compounding the nurse shortage. The shortfall of nurses erodes the quality of healthcare services and increases patient morbidity and mortality (Organization for Economic and Co-operation Development, 2008).

More robust academic activities ranging from preventive to curative in nature have been suggested for interventions aimed at reducing the attrition rate in higher education institutions (HEIs). The preventative

measures that have been proposed include imposing higher admission requirements such as nursing-related work experience (Wilson et al., 2011), selecting students who indicate that nursing is their first choice (Salamonson et al., 2014), and selecting those who have taken science-related subjects and achieved good academic performance (Potolsky et al., 2003). Curative measures include introducing students to clinical mentors, academic advisors, and peer mentors (Robinson and Niemer, 2010; Jokelainen et al., 2011), and implementing stress management programmes such as those focusing on cognitive-behavioral therapy and relaxation techniques (Galbraith and Brown, 2011). In general, a curriculum can be designed to include the aforementioned measures to reduce attrition among baccalaureate student nurses.

1.3. Reasons for Attrition among Undergraduate Nursing Students

According to Glossop (2002), attrition is defined as ‘the difference between the number of students beginning each cohort and the numbers who completed that cohort’. Since high attrition rates among undergraduate nursing students have been reported globally, the various internal and external reasons for this phenomenon have been studied. Personality traits have been identified as one of the causes (McLaughlin et al., 2008). Less help-seeking behaviour has been observed in

individuals with lower self-efficacy, who then tend to have less motivation to meet the standards in university (Pitt et al., 2012). Students with poor coping and stress management skills are also prone to dropping out from nursing programmes, particularly at the time of their first clinical placement (Galvin et al., 2015). Students may underestimate the knowledge and responsibilities required to become a professional nurse due to a lack of previous experience in a caring profession (Kukkonen et al., 2016). The discrepancy between their perceptions and their clinical experience thus leads to attrition (O'Donnell, 2011).

External forces also affect dropout rates. The clinical placement is an important part of a baccalaureate nursing programme, with a minimum of 1400 and 1100 h of clinical placement required in Hong Kong and New Zealand, respectively (The Nursing Council of Hong Kong, 2016; Nursing Council of New Zealand, 2017). The clinical placement experience affects student attrition (Prymachuk et al., 2009; Wray et al., 2012). According to ten Hoeve et al. (2017), the perception of a lack of support from clinical mentors and staff reinforced the decision of students to discontinue their studies. Moreover, unexpectedly high academic demands and heavy workloads in university, are factors that have been noted to contribute to attrition (Chan et al., 2009; O'Donnell, 2011). In summary, complex factors related to attrition have been analysed in previous studies, but little attention has been paid to the design of the curriculum in undergraduate nursing programmes. This issue thus requires further exploration.

A search using the established keywords uncovered four systematic reviews for comparison (Stewart et al., 2006; Cameron et al., 2011; Eick et al., 2012; Mooring, 2016). Many studies were methodologically limited, being descriptive rather than analytical, reliant on small convenience samples, and focused on assessing intentions rather than on measuring attrition or retention as outcomes. Instead of considering clinical placements (Eick et al., 2012) or other factors (Mooring, 2016), the aim of this study is to explore how curriculum design affects attrition among nursing students. To obtain more comprehensive data the focus is solely on undergraduates (Stewart et al., 2006), with no geographical limitations (Cameron et al., 2011).

2. Method

This research was conducted by means of a systematic review (Uman, 2011). In this study, the PRISMA checklist 2009 was adopted (Fig. 1) because of its transparency and clarity. The items of the checklist provide clear instructions and guidance on how to conduct a systematic review (Gopalakrishnan and Ganeshkumar, 2013; Panic et al., 2013).

2.1. Samples and Settings

The PICO model was adopted to assist in organizing the keywords (Schardt et al., 2007). Tables 1 and 2 show the identified keywords, and one example of this search for papers in Medline via OvidSP.

2.2. Inclusion and Exclusion Criteria

To ensure the relevance of the selected research papers, specific screening criteria were adopted. For inclusion, the study samples had to be made up largely of undergraduate nursing students and the focus had to be on student attrition and programme design. The papers also had to be primary research publications written in English and published between 1999 and 2018. The exclusion criteria included papers in which the majority of the participants in the study were not undergraduate nursing students, papers focusing on areas other than student attrition and programme design, literature reviews, dissertations, papers not written in English, and those published outside of the above mentioned time frame.

2.3. Measurement and Outcomes

A search of all of the databases yielded 20,522, with 17,726 remaining after a timeframe was imposed (Fig. 1). After a screening using the CINAHL database, 49 out of 325 entries were eliminated.

The research team consisted of eight nursing students supervised by a nurse educator. The students were divided into two subgroups for peer reviews. Two student authors would independently screen titles, abstracts, or full-text publications, and then conduct a peer review. If there were any disagreements on the results of the screening, the supervisor would assist in verifying the results.

2.4. Quality Appraisal and Analytic Procedures

Since qualitative, quantitative, and mixed-methods studies were included in this review, the Mixed Methods Appraisal Tool (MMAT) (Souto et al., 2015) was adopted for the two reviewers (student authors) to evaluate the quality of the selected research studies. In the beginning, two screening questions were used for all types of studies to determine whether the research questions or objectives had been clearly stated and whether the collected data suited the aims of the study. All 16 studies in this review met the requirements (Table 3). Section 1 of the MMAT was used to appraise the qualitative studies. A few limitations were found in two qualitative studies; for example, insufficient consideration was given to the characteristics of the chosen universities versus those of other settings of the same type. However, the two studies fulfilled three of the four criteria, so those studies were deemed to be suitable for inclusion in this review. Sections 2, 3, and 4 focus on quantitative studies, namely, randomized controlled, non-randomized, and descriptive studies, respectively. The criteria for inclusion and exclusion were not clearly stated in one study, as the data were from an existing database and records in the study institute. Nevertheless the samples were related to the study's target population, so the study was considered relevant to this review. As for mixed-methods studies, Section 1 was used to appraise the qualitative component while Sections 2, 3, and 4 were used for the quantitative components. Section 5 was used for the mixed-methods component. All of the mixed-methods studies in this review were found to be of good quality.

Thematic analysis (Boyatzis, 1998) was the approach used in this study. It is a flexible method used to analyse case studies and phenomenological, generic qualitative, and narrative data. It consists of six steps: Familiarization, Generating the initial codes, Creating the initial themes, Reviewing the initial themes, Naming and defining the themes, and Writing the final report (Braun and Clarke, 2013). Themes can be discerned from the data by coding the transcripts and finding the relationships between the coded transcripts.

3. Results

3.1. Methodologies

A total of 16 studies were included in this review, namely, 2 quantitative studies (Prymachuk et al., 2009; Abele et al., 2013), 9 qualitative studies (Glogowska et al., 2007; Wells, 2007; Andrew et al., 2008; Bowden, 2008; O'Donnell, 2011; Hamshire et al., 2012; Kukkonen et al., 2016; Farahani et al., 2017; ten Hoeve et al., 2017), and 5 mixed-methods studies (Last and Fulbrook, 2003; Brodie et al., 2004; Boyle et al., 2008; Banks et al., 2012; Hamshire et al., 2013) (Table 4). In 6 of the studies, questionnaires were used to collect data (Last and Fulbrook, 2003; Brodie et al., 2004; Glogowska et al., 2007; Andrew et al., 2008; Bowden, 2008; Banks et al., 2012), in 13 of the studies, data were collected through interviews (Last and Fulbrook, 2003; Brodie et al., 2004; Glogowska et al., 2007; Wells, 2007; Andrew et al., 2008; Bowden, 2008; O'Donnell, 2011; Banks et al., 2012; Hamshire et al., 2012; Hamshire et al., 2013; Kukkonen et al., 2016; Farahani et al., 2017; ten Hoeve et al., 2017), and in 4 studies, focus

Table 1
Keywords in databases.

Type of search terms	Search terms	Boolean operator
Population		
MeSH/CINAHL headings	Students, Nursing/Students, Pre-Nursing/Students, Nursing, Baccalaureate/Students, Nursing, Practical/Baccalaureate Nurses/Education, Nursing, Baccalaureate (MM “Students, Nursing”) OR (MM “Students, Pre-Nursing”) OR (MM “Students, Nursing, Baccalaureate”) OR (MM “Students, Nursing, Practical”) OR (MM “Baccalaureate Nurses”) OR (MM “Education, Nursing, Baccalaureate”)	1. OR 2. OR AND
Freetext keywords	Student nurs*, nurs* students, undergraduate nurs*, baccalaureate nurs*	
Intervention		
MeSH/CINAHL headings	Education, Baccalaureate/Education, Clinical/Teaching Methods, Clinical/Teaching Materials, Clinical/Practical Nursing (MM “Education, Baccalaureate”) OR (MM “Education, Clinical”) OR (MM “Teaching Methods, Clinical”) OR (MM “Teaching Materials, Clinical”) OR (MM “Practical Nursing”)	1. OR 2. OR AND
Freetext keywords	Education*, program design, curricul*, teaching method, training, practic*, teach*	
Outcome		
MeSH/CINAHL headings	Students dropout/Academic failure/Academic Performance (MM “Student Dropouts”) OR (MM “Academic Failure”) OR (MM “Academic Performance”)	1. OR 2. OR AND
Freetext keywords	Attrition, dropout, academic failure, quit, leave, discontinuation, withdrawal	

Table 2
Search strategy for Medline via OvidSP.

Search strategy used for Medline via OvidSP
#1 Students, Nursing/Students, Pre-Nursing/Students, Nursing, Baccalaureate/Students, Nursing, Practical/Baccalaureate Nurses/Education, Nursing, Baccalaureate
#2 (student nurs*, nurs* students, undergraduate nurs*, baccalaureate nurs*).af.
#3 Education, Baccalaureate/Education, Clinical/Teaching Methods, Clinical/Teaching Materials, Clinical/Practical Nursing
#4 (education*, program design, curricul*, teaching method, training, practic*, teach*).af.
#5 Students dropout/Academic failure/Academic Performance
#6 attrition, dropout, academic failure, quit, leave, discontinuation, withdrawal
#7 1 OR 2
#8 3 OR 4
#9 5 OR 6
#10 7 and 8 and 9
#11 limit 10 to yr = “1999–2018”
#12 limit 13 to full text

group interviews were employed to obtain the data set (Last and Fulbrook, 2003; Brodie et al., 2004; Banks et al., 2012; Farahani et al., 2017).

3.2. Sample

The size of the sample in the studies ranged from 11 (Wells, 2007) to 1259 (Prymachuk et al., 2009), with larger sample sizes found in the quantitative studies and smaller sample sizes in the qualitative studies. The sex of the participants was specified in 10 papers (Glogowska et al., 2007; Wells, 2007; Andrew et al., 2008; Boyle et al., 2008; O'Donnell, 2011; Hamshire et al., 2012; Abele et al., 2013; Hamshire et al., 2013; Kukkonen et al., 2016; ten Hoeve et al., 2017), but not in the remaining 6 papers (Last and Fulbrook, 2003; Brodie et al., 2004; Bowden, 2008; Prymachuk et al., 2009; Banks et al., 2012; Farahani et al., 2017). Females accounted for the majority of the samples where gender was specified. In some studies, the age of the participants was not mentioned. The participants in the studies were of diverse ethnicities, including African American, American Indian, Asian, Hispanic, White European, Chinese, and Latin Americans. Convenience sampling was the most frequently used method of sampling in the studies, but purposive sampling was also used in some studies. The participants were recruited from different universities, colleges, nursing courses, or pre-registration nursing programmes in different countries.

3.3. Outcomes

Four main themes related to attrition and programme design were

identified from these studies: pre-enrolment criteria for recruiting nursing students, curriculum content, policies related to clinical placements, and student support services (Table 5). All of the reasons for attrition, including those not related to programme design, were listed as well (Table 6). These four themes will form the framework for the following discussion.

3.4. Pre-enrolment Criteria for Recruiting Nursing Students

Prior to admission, attrition can be prevented through the proper screening of applicants. Farahani et al. (2017) found that nursing students who intended to leave or who had left the programme were under the illusion that nursing and medicine were similar, while some students underestimated the academic demands of the programme (Glogowska et al., 2007; Wells, 2007; Andrew et al., 2008; Boyle et al., 2008; O'Donnell, 2011). Such students may demonstrate little or no commitment to the nursing profession. For instance, some chose nursing because they wanted to get a university degree, bypass the entrance exam, and study another field such as medicine (Farahani et al., 2017). This highlights the importance of adopting pre-enrolment criteria.

Prymachuk et al. (2009) found that age and educational qualifications predicted completion rates. The risk of discontinuation increases with the following characteristics: being less mature, being from a minority group, being male, and having lower qualifications. Boyle et al. (2008) evaluated the effectiveness of multiple strategies, including setting the following admission criteria: having experience in health-related work or volunteer experience, having multicultural experience, living or working in the district where one would have a placement and work after graduation, and having taken prerequisite courses. Under such a programme, attrition rates were reduced by 5% and 14% in comparison with a traditional BSN programme and community college nursing programme, respectively. Having pre-requisite courses in science and non-science subjects has been reported to be predictive of completion (Abele et al., 2013). It is argued that past experiences stemming from life events and family influence may instil unrealistic expectations in students, leading to attrition (O'Donnell, 2011). Therefore, caution is required when assessing nursing students during the recruitment period. It is suggested that comprehensive information be provided to students before enrolment, via open days, school visits, and pre-university career advice services, to enable students to consider how suited they are to a nursing career.

3.5. Curriculum Content

In the qualitative studies, the major complaint of students who quit was that they were unprepared for the depth and breadth of the courses

Table 3
Appraisal of selected studies.

Types of mixed methods study components or primary studies	Methodological quality criteria	Yes	No	Can't tell	Comments
	Mixed Methods Appraisal Tool (MMAT) (Pluye et al., 2011)				
Screening questions (for all types)	<ul style="list-style-type: none"> ● Are there clear qualitative and quantitative research questions (or objectives^a), or a clear mixed methods question (or objective)? ● Do the collected data allow address the research question (objective)? 	16	0		
1. Qualitative (n = 9)	1.1 Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)? 1.2 Is the process for analyzing qualitative data relevant to address the research question (objective)? 1.3 Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected? 1.4 Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?	9	0		
2. Quantitative randomized controlled (trials) (n = 0)	2.1 Is there a clear description of the randomization (or an appropriate sequence generation)? 2.2 Is there a clear description of the allocation concealment (or blinding when applicable)? 2.3 Are there complete outcome data (80% or above)? 2.4 Is there low withdrawal/drop-out (below 20%)?	0	0		
3. Quantitative non-randomized (n = 0)	3.1 Are participants (organizations) recruited in a way that minimizes selection bias? 3.2 Are measurements appropriate (clear origin, or validity known, or standard instrument; and absence of contamination between groups when appropriate) regarding the exposure/intervention and outcomes? 3.3 In the groups being compared (exposed vs. non-exposed; with intervention vs. without; cases vs. controls), are the participants comparable, or do researchers take into account (control for) the difference between these groups? 3.4 Are there complete outcome data (80% or above), and, when applicable, an acceptable response rate (60% or above), or an acceptable follow-up rate for cohort studies (depending on the duration of follow-up)?	0	0		
4. Quantitative descriptive (n = 2)	4.1 Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)? 4.2 Is the sample representative of the population under study? 4.3 Are measurements appropriate (clear origin, or validity known, or standard instrument)? 4.4 Is there an acceptable response rate (60% or above)?	2	0		
5. Mixed methods (n = 5)	5.1 Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)? 5.2 Is the integration of qualitative and quantitative data (or results) relevant to address the research question (objective)? 5.3 Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results) in a triangulation design?	5	0		

^a These two items are not considered as double-barreled items since in mixed methods research, (1) there may be research questions (quantitative research) or research objectives (qualitative research), and (2) data may be integrated, and/or qualitative findings and quantitative results can be integrated.

Table 4
Characteristics of the included study.

Author, year, country	Aims	Study design	Sampling i) Sample size ii) Type of participants iii) Gender	Data collection method	Data analysis method	Main focus and significant findings
Abele et al. (2013) US	To fill a gap in the literature by specifically examining factors related to attrition among nursing students that are on academic probation	Quantitative exploratory Retrospective study	i) n = 327 ii) Students in traditional BSN or accelerated second-degree nursing program placed on academic probation between 2002 and 2010 iii) Female:249 Male: 78	Retrospective review of an existing student database	Logistic regression: a short statistical primer	Non-science course such as lifespan developmental psychology and the number of courses failed are significantly predictive of students' attrition.
Andrew et al. (2008) Australia	To explore whether students who leave the BN course in the first semester leave for the same, or different reasons, than students who leave in the second semester	Qualitative descriptive study	i) n = 17 ii) Discontinuers in undergraduate BN course iii) Female: 10 Male: 7	Questionnaire and telephone interview	Transcribed and analysed employing the method adapted from Coffey and Atkinson	In the first semester, students who leave consider themselves unprepared for university and develop a strong dislike of the nursing course. They decide quickly that the course is unsuitable and leave. Those who leave in second semester would prefer to stay but events in their life create a crisis where they can no longer cope with university studies. These students hope to return to nursing whereas students who leave in the first semester are unlikely to consider returning.
Banks et al. (2012) Scotland	To explore nursing and midwifery student support needs and their experience of, and satisfaction with, the Pastoral Care Support Advisor service	Qualitative and quantitative methods	i) n = 652 ii) Students from nursing and midwifery and staff; Staff (n = 14) and students (n = 25) participated in telephone and focus group interviews to express their needs. Two online surveys developed and completed by staff (n = 88) and students (n = 525) iii) Not mention	Focus group, telephone interview, face to face interview and survey	Descriptive statistics, t-tests, chi square and ANOVA using SPSS version 15	A majority of staff indicated that students had more complex problems than in the past, and would benefit from access to a dedicated source of support. Levels of anxiety and depression among students were found to be above a desirable level, and three quarters of students who completed the survey reported having experienced problems. Some members of staff believed that the PSA had had an impact on attrition, and students that participated reported that they would have left had they not received this support. The PSA service not only benefitted the students it also reduced staff time spent with students on non-academic issues. A source of independent support would benefit students, university staff, and the National Health Service.
Bowden (2008) UK	To show that the experiences of nursing students who consider leaving but who stay with the course can add to our understanding of attrition in nurse education	Qualitative single case study design	i) n = 93 ii) All nursing students who completed their pre-registration program in one English institution between September 2004 and March 2005 iii) Not clearly indicated	Postal questionnaire and face-to-face interviews	Thematic analysis	The factors prompted these students leaving are around academic issues, placement issues, financial issues and personal issues. The factors enabled them to stay are university staff, peers, family and friends.
Boyle et al. (2008) US	To evaluate the effectiveness of a satellite nursing program involving a community healthcare district, a community hospital, a community college, and a state university in	Qualitative and quantitative methods	i) n = 112 ii) Nursing students admitted to the program in fall 2004 and graduated in spring of 2006	Experimental group: the nursing students admitted in the 2-year satellite program No control group	Descriptive statistics	The satellite program increased the enrollment of baccalaureate nursing students by 50%. The attrition rate for the first class is 18.2% when defined in terms of on-time graduation and 6.1%

(continued on next page)

Table 4 (continued)

Author, year, country	Aims	Study design	Sampling i) Sample size ii) Type of participants iii) Gender	Data collection method	Data analysis method	Main focus and significant findings
	enrollment, retention, performance in licensing examination and employment of baccalaureate nursing students		ii) Female: 90 Male: 22			when all graduates are included. Comparable attrition rates for California BSN programs are 20.56% for on-time graduation and 10.76% for all graduates. Their work could serve as a model for other collaborative efforts to expand nursing education and reduce the shortage of nurses.
Brodie et al. (2004) UK	To investigate nursing students initial perception and changes of the perceptions after entering the nursing programme.	Mixed method: Quantitative questionnaire survey & Qualitative descriptive phenomenology	i) n = 650 ii) Nursing students (diploma and degree) from two British institutions iii) Not clearly indicated	A combined questionnaire (phase 1), interview (phase 2) and focus group (phase 3)	Descriptive and inferential statistics & the grounded theory	This study found out that the nursing students got unexpected perception towards the programme requirements such as skills, knowledge and attitudes required. The experiences of nursing students presented an image of low-salary and high-workload profession that lacks respect and having discourage atmosphere. They suggested changes in nursing education at the institutional level to relieve nursing student's burden. Attrition factors were categorized into two themes: 'before admission' and 'after admission'. The most significant factors related to attrition were poor management of nursing workforce, improper supervision, differences between their experiences and expectations and the negative experiences of clinical placement.
Farahani et al. (2017) Iran	To elucidate the factors that cause students drop out or a willingness to drop out as viewed by the students	Qualitative descriptive study	i) n = 19 ii) Students who intended to leave or had already left a nursing school at three nursing colleges in Tehran iii) Not clearly indicated	Focus groups, face-to-face semi-structured interviews and observation	Conventional content analysis	The article suggests that decisions to leave are related to culmination of complex interacting factors. Six 'push' factors are explored from a group of students: challenges of academic work, burden of other demands, financial strain, lack of support, negative early experiences and illness/injury. The article also discusses four 'pull' factors which make students stay. Adding support for students is considered to be recommendation to meet students' needs.
Glogowska et al. (2007) UK	To compare data from semi-structured interviews with students who had withdrawn without completing their program and students who considered leaving, but chose to stay	Qualitative study	i) n = 49 ii) students from the second year of a pre-registration nursing course and ex-students who withdraw from adult nursing course iii) Female: 47 Male: 2	Questionnaire and semi-structured interview	Thematic analysis	Unsatisfactory clinical placement experiences was a frequent trigger to hasten the students' decision to leave. Three themes were identified as difficulties in placements included ineffective placement organization such as short notice period and unsupported from mentors, problematic placement journey and disappointing clinical experiences.
Hamshire et al. (2012) UK	To investigate healthcare students' university learning experiences and the circumstances related factors of their attrition.	Qualitative descriptive phenomenology	i) n = 16 ii) Recently discontinued students from nursing programme and allied health professions iii) Female: 14 Male: 2	Telephone interview (narrative inquiry)	Framework analysis	

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Table 4 (continued)

Author, year, country	Aims	Study design	Sampling i) Sample size ii) Type of participants iii) Gender	Data collection method	Data analysis method	Main focus and significant findings
Hamshire et al. (2013) UK	To identify and explore the factors that make students consider leaving their programme and how factors combined	Sequential mixed methods design	i) n = 1080 ii) All students studying on NHS North West commissioned programmes iii) Not clearly indicated	Online survey Interviews		465 students (47%) indicated that they had considered leaving. Three theme including dissatisfaction with academic workload and support, difficulties associated with clinical placements and personal concerns and challenges were identified. A significant number of student comments combined two or more of the themes. The results show that the nursing student population is diverse, which has an effect on the students' career intentions, their learning and their ability to cope with studies. In nursing education, it is important to identify students who are at risk of discontinue their studies and develop individual support systems to help nursing students complete their studies and enter into the workforce.
Kukkonen et al. (2016) Finland	To describe who is a discontinued student in nursing education and the students' own ex-periences of reasons for leaving a nursing school.	Qualitative descriptive design	i) n = 25 ii) nursing students who had discontinued their their studies in nursing education program during a single academic year 2009–2010 in two different nursing schools in Finland iii) Female: 22 Male: 3	Semi-structured interviews	Deductive content analysis	This study suggested that students attrition does not point to only a reason but multiple factors. Placement related experiences, stress and unmet expectations are the examples of factors that contribute cumulatively to students attrition.
Last and Fulbrook (2003) UK	To establish a consensus view of the reasons why student nurses were leaving	Mixed method: Exploratory (Qualitative) + Delphi study (Quantitative)	i) n = 50 ii) Student nurses, representing all 3 years of the pre-registration programme, educators, staff nurses, doctors, and managers iii) Not mentioned	Focus groups and semi-structured one-to-one interviews + 48-statement attitude questionnaire	Content analysis	The study identified unrealistic student expectations of nursing preparation programmes as a significant factor in later decisions to voluntarily withdrawal. The study explored the expectations which ex-students had of pre-registration nursing courses prior to entry, the self-assessed influences which shaped prior ex-student expectations and subjective experiences following entry into nursing courses. A significant number of ex-students had the prior expectation that nursing courses would be largely non-academic and more likely vocational in design and content. Students who were older on entry were more likely to complete the programme than younger students, and those who had only the minimum educational qualifications on entry were less likely to complete than those with higher-level qualifications. The risk for discontinuation increases with taking the child branch, being black/minority. The course structure and support
O'Donnell (2011) UK	To identify the reasons for voluntary attrition in pre-registration nursing students	Qualitative single case study design	i) n = 15 ii) Ex-nursing students who had voluntarily withdrawn from a pre-registration nursing program during the period 2004–2007 iii) Female: 13 Male: 2	Semi-structured interview	The Cyclical or Interactive Model of qualitative data analysis	(continued on next page)
Prymachuk et al. (2009) UK	To identify factors that contribute to students completion rates in pre-registration nursing programme.	Quantitative retrospective cohort study	i) n = 1259 ii) Nursing students from a large English university who commenced their studies between the summer of 2002 and autumn of 2003 iii) Not clearly indicated	Routinely collected data	SPSS 2003 for Windows	

Table 4 (continued)

Author, year, country	Aims	Study design	Sampling i) Sample size ii) Type of participants iii) Gender	Data collection method	Data analysis method	Main focus and significant findings
ten Hoeve et al. (2017) The Netherlands	To examine both intrinsic and extrinsic factors that influence student nurses' decision to leave or complete their program	Qualitative exploratory descriptive design	i) n = 17 ii) Student nurses at the beginning of their third year of the four-year Bachelor's program at four universities of Applied Sciences in the Netherlands, from December 2013 to January 2014 iii) Female: 15 Male: 2	Semi-structured interviews	Thematic analysis	influenced students' choices whether to stay or leave the programme. The main reasons for students to become nurses were the caring aspect, personal experiences with healthcare, role models in their immediate environment, and job opportunities. They had both altruistic and professional perceptions of their profession. Reasons for attrition were strongly related to the training programme and to their clinical placements, in particular the perceived lack of support from mentors and team. Feelings of being welcomed and working in a nice team proved to be more important reasons for completing the programme than the specific clinical field.
Wells (2007) US	To examine the reasons that a sample of undergraduate baccalaureate nursing students withdrew from their nursing programs	Qualitative study	i) n = 11 ii) Nursing students who left generic baccalaureate nursing programs located in an urban area of a southeastern state between fall 1998 and spring 2000 iii) Female: 10 Male: 1	Semi-structured interview guide was used to conduct taped telephone interviews with study participants	Thematic data analysis	Nursing student departure did not appear to be related to a single stressor but a combination of two or more stressor such as a cumulative effect of study participants' disillusionment about the nursing program practices and the nursing profession, perceived lack of support from faculty, and/or nursing staff for the achievement of the students' educational goals, disillusionment about campus life and the campus environment, and/or stressors in the external environment.

Table 5
Nursing curriculum design as a factor to student attrition.

Author, Year, Country	Pre-enrolled criteria of recruiting nursing students	Curriculum Content	Clinical Placement related policies	Student supporting services (e.g. academic support, student advising)
Abele et al. (2013) US	✓			
Andrew et al. (2008) Australia	✓	✓		
Banks et al. (2012) Scotland		✓	✓	✓
Bowden (2008) UK				✓
Boyle et al. (2008) US	✓			
Brodie et al. (2004) UK			✓	
Farahani et al. (2017) Iran	✓		✓	
Glogowska et al. (2007) UK	✓	✓		✓
Hamshire et al. (2012) UK			✓	✓
Hamshire et al. (2013) UK			✓	✓
Kukkonen et al. (2016) Finland				✓
Last and Fulbrook (2003) UK		✓		✓
O'Donnell (2011) UK	✓	✓	✓	
Prymachuk et al. (2009) UK	✓			✓
ten Hoeve et al. (2017) The Netherlands			✓	✓
Wells (2007) US	✓	✓	✓	✓

in the undergraduate nursing programme (Last and Fulbrook, 2003; Glogowska et al., 2007; Wells, 2007; Andrew et al., 2008; O'Donnell, 2011; Banks et al., 2012). A discrepancy in expectations can be inferred, since the students expected nursing to be more practical and common-sense in content, while the focus was on academic skills such as referencing and writing, and learning theories and scientific explanations. Independent learning was another feature of university learning to which they failed to become accustomed. In Last and Fulbrook's study (2003), the majority of students (91%) felt stressed at the heavy academic workload, and 75% agreed that students left the programme because of an inability to cope with the academic assignments. Class sizes and teaching methodologies can also affect the learning experiences of students. For example, overly large classes discourage participation and affect placement opportunities (Last and Fulbrook, 2003). Wells (2007) suggested using anonymous surveys to evaluate the teaching-learning process can improve the quality of the education provided to students and promote their success.

3.6. Policies Related to Clinical Placements

Policies related to clinical placements, which involve unsatisfactory arrangements in the placement and a lack of caring and support, also contribute to high attrition rates. Unsatisfactory arrangements have included unbalanced mentor-student ratios, late notification of placement-related information, inadequate facilities and heavy workloads during the placement, and a lack of communication between clinical placement areas and universities (Hamshire et al., 2012; Hamshire et al., 2013; Farahani et al., 2017; ten Hoeve et al., 2017). The failure to ensure a suitable mentor-student ratio effectively reduces students' learning opportunities in the ward (Farahani et al., 2017). Reviews have shown that students become anxious and confused at sudden changes to their timetables and when given short notice about their placement schedule (Hamshire et al., 2012; ten Hoeve et al., 2017). Facilities to meet the students' basic needs during their clinical placement should be arranged by the hospital after communicating with the school. During most placement periods, students have shift working hours. Despite their heavy workload in the hospital, nursing students still have to complete a substantial amount of academic homework (Hamshire et al., 2013). This can affect the students' placement experience and is one of the main reasons for attrition.

Insufficient support and care from the school also contributes greatly to a negative placement experience. Brodie et al. (2004) reported that students often had unfavourable experiences of working with nursing staff and harboured negative feelings about their future career during placements in wards. During their practicum, students

need to work individually without a school instructor, which causes them to feel helpless even if they do have a clinical nursing mentor (Farahani et al., 2017). Due to a lack of emotional and practical support from mentors and colleagues, students often feel as if they are not part of the team (O'Donnell, 2011). Also mentioned in some studies are negative attitudes displayed by some mentors during the placement period, such as discouragement, unhelpfulness, and harshness (Brodie et al., 2004; Wells, 2007). For example, nurses might not give the students any instructions on their assignments, might not spare the time to teach them, or might even avoid them. In their study, Banks et al. (2012) found that throughout their training period, the students were left alone in a ward without instructors or were forced to carry out non-professional tasks such as making beds, to reduce the workload of the instructors or to compensate for staff shortages. As a result, students did not get much positive feedback from the nurses, and the atmosphere significantly reduced their interest in learning.

3.7. Student Support Services

There was an obvious need to provide support services due to the heavy academic workload and stress experienced by the students. Students, particularly first-year students, need advice and emotional support (Last and Fulbrook, 2003; Hamshire et al., 2013; ten Hoeve et al., 2017). Banks et al. (2012) found that students sought access to support services mainly because of personal, academic, financial, and placement problems. Lacking support and care from the faculty make students feel not being empathized and not being helped when they got personal issues that affecting their possibility of staying in the programme (Wells, 2007). The services were highly rated, with more than half of the students indicating that they had enabled students who had considered dropping out to remain in the course.

However, such services were not always sufficient. Various factors leading to insufficient support were identified. Last and Fulbrook (2003) pointed out that when tutors and clinical staff were in different geographical locations, students encountered difficulties commuting between the two places, which inhibited communication and rapport. The tutors were also not always available, thus, students might have found it difficult to contact them (Glogowska et al., 2007). Hamshire et al. (2012) pointed out that some staff members did not respond to emails or were too busy to spend time supporting students.

Students at risk of dropping out would have a better educational experience if the school were to set up a system to identify them (Kukkonen et al., 2016), and follow up with appropriate support services. Students with difficulties also reported that they do not sought help even there are support mechanisms provided by the institutions

Table 6
Reason of attrition.

Author, year, country	Content/workload of the course	Academic performance/ GPA	Clinical experience	Mentoring/support	Disparity between perception and reality/ theory and practice	Employment prospect	Financial difficulties
Abele et al. (2013) US	✓			✓	✓		✓
Andrew et al. (2008) Australia	✓	✓	✓		✓		✓
Banks et al. (2012) Scotland	✓			✓	✓		✓
Bowden (2008) UK		✓	✓				✓
Boyle et al. (2008) US			✓		✓		✓
Brodie et al. (2004) UK	✓		✓		✓		✓
Farahani et al. (2017) Iran	✓		✓		✓		✓
Glogowska et al. (2007) UK	✓		✓		✓		✓
Hamshire et al. (2012) UK	✓		✓		✓		✓
Hamshire et al. (2013) UK	✓		✓		✓		✓
Kukkonen et al. (2016) Finland	✓		✓		✓		✓
Last and Fulbrook (2003) UK	✓		✓		✓		✓
O'Donnell (2011) UK	✓		✓		✓		✓
Pryjmachuk et al. (2009) UK	✓	✓	✓		✓		✓
ten Hoeve et al. (2017) The Netherlands	✓		✓	✓	✓		✓
Wells (2007) US	✓		✓	✓	✓		✓

since the services provided are not famous among students and they perception towards the services is negative (Bowden, 2008). Pryjmachuk et al. (2009) suggested that tutors or teachers in the institution can provide not only academic support but also pastoral support which can prevent students being socially isolated, hence prevent them from dropping out the nursing programme. Institutions should also recognize that social isolation can be problem among students, and provide more resources to support such students.

4. Discussion

4.1. Similarities with the Results of Previous Systematic Reviews

Some of the findings in this review are similar to those of previous reviews (Stewart et al., 2006; Cameron et al., 2011; Eick et al., 2012; Mooring, 2016). Differences in expectations have previously been identified as a problem. The public image of a nurse is one who is engaged in ‘hands on’ tasks, like a servant instead of a professional. Students who see nurses as professionals are more likely to leave the programme (Cameron et al., 2011). Also previously identified are differences in expectations regarding the learning materials in the course, with some students being unprepared to find science subjects included in the nursing curriculum (Stewart et al., 2006). The perception of a lack of support has also been found in previous reviews, with Mooring (2016) finding that providing academic advice could help reducing academic failures. Likewise, the poor quality of some placements (Cameron et al., 2011) has been found to give some students the impression of a lack of support (Eick et al., 2012).

4.2. Differences with the Results of Previous Systematic Reviews

Regarding the issue of attrition among baccalaureate nursing students, most systematic reviews have focused on demographic and personal factors such as students' characteristics, coping strategies, family circumstances, and financial difficulties (Cameron et al., 2011; Pitt et al., 2012). However, these factors are unlikely to change within a short period of time. Placement-related experiences, such as a lack of support from clinical staff and an unpleasant learning atmosphere, are common problems (Eick et al., 2012; Merkley, 2015). In fact, these issues are related to the design of the undergraduate nursing curriculum, which is a broad topic. Few reviews have focused on the relationship between the design of the nursing curriculum and attrition among undergraduate nursing students, which is the aim of this study. Four interrelated factors were identified in this review: admission requirements, curriculum content, clinical placement-related policies, and student support services. The subject of programme design has been examined, from nursing prerequisites and university courses to administrative and clinical policies, which concern all nursing students from admission to graduation. Improvements in curriculum design can help students to better arrange their workload so that attrition rates can be reduced.

4.3. Most Important Findings

Urwin et al. (2010) identified three levels of factors contributing to attrition among nursing students: individual, institutional, and political. This review highlighted the significance of institutional-level factors.

The results of 16 studies indicated that nursing student attrition is closely related to the policies of nursing faculties. Irrespective of demographic and cultural differences, establishing a range of support mechanisms was found to be essential (McKendry et al., 2014). Various attrition risk factors, such as academic failure, poor clinical performance, and stress, could be ameliorated by efficient support mechanisms. Moreover, the evidence shows that the gap between expectations of nursing and the reality is a factor contributing to attrition among

nursing students (O'Donnell, 2011). To prevent unrealistic expectations, more accurate pre-entry information should be provided to potential students and more comprehensive recruitment strategies should be implemented, such as face-to-face interviews.

According to five studies in this review, a significant number of nursing students dropped out because of an unsatisfactory clinical experience. The underlying reasons were found to be a lack of support from their mentor, an unfriendly working atmosphere, inadequate skills training, and so on (Hamshire et al., 2012). Collaboration between nursing faculties and those in the clinical field is of great importance in addressing the problem. It is also the responsibility of nursing faculties to provide more intensive clinical skills training, clinical advice, and emotional support to ensure a satisfactory learning experience.

Institutions providing nursing education play a vital role in improving both the academic and clinical learning experience of students. A high-quality nursing education would likely lead to a drop in the attrition rate among nursing students, relieving the problem of nursing shortages.

5. Limitations

There are several limitations to this review. The results may not be applicable to all countries, as there may be differences in the design of the nursing curriculum in different countries, such as in the length of the programme and the composition of the courses, all of which could affect attrition rates. Another limitation that might affect the generalizability of the results is the exclusion of studies targeting accelerated programmes, associate degrees, and nursing schools not affiliated with universities. However, the focus on undergraduate nursing programmes ensures that this study is valid with regard to how the design of baccalaureate nursing programmes influences student attrition. Each study selected participants from their own programme, resulting in students of varying ages, genders, and ethnicities. The heterogeneity of the sample could also limit the generalizability of this study. Moreover, the sample was small in some studies. Of the 16 studies selected for this review, only 8 had a sample larger than 50 students. Furthermore, only publications written in English were selected for this review, potentially leading to bias or causing some potentially valuable studies to be overlooked. Lastly, the criteria for inclusion and exclusion excluded some publications on student retention that might have been partially related to attrition.

6. Conclusion

Attrition in undergraduate nursing programmes was found to be mainly due to several institutional factors, including inefficient support mechanisms, gap between expectations and reality, and an unsatisfactory clinical experience. The implication is that efficient support mechanisms such as the provision of mentoring and emotional support could reduce other risk factors of attrition. This review contributes insights for developing nursing programmes, suggesting areas in which the design of the undergraduate nursing curriculum could be improved to help students remain in the programme. The result would be to increase the long-term nursing workforce, which in turn would lead to the provision of higher-quality patient care and ameliorate the problem of nursing shortages. Further quantitative studies on attrition rates among undergraduate nursing students around the world could be carried out in a standardized manner, so that comprehensive comparisons can be made. More rigorous longitudinal studies to evaluate the effectiveness of changes in curriculum design in relation to attrition rates are warranted. Further qualitative studies can be conducted that focus exclusively on the issue of how school policies can facilitate student learning in nursing programmes.

7. Recommendations

Although there are complex reasons rather than a single cause for student attrition, schools or institutions can still implement some changes to retain undergraduate nursing students. First, they can amend their admission requirements to include health-related experience and science courses as prerequisites. Schools can also conduct interviews to assess student motivation and expectations. Student expectations of the nursing curriculum could be modified by means of open days, school visits, and the provision of career advice with a system for students to give regular feedback. More communication between clinical and teaching staff over policies related to clinical placements, such as relevant arrangements and support systems, could reduce student stress. Adequate supervision can improve the quality of teaching and maximize students' learning experiences in clinical placement. It is essential for students to be able to access support services.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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